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Responsiveness Summary for the Proposed Plan for the Final Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site

January 2004

U.S. Department of Energy
Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

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January 2004

prepared by

U.S. Department of Energy
Office of Legacy Management
Weldon Spring Site Remedial Action Project
Weldon Springs, Missouri

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RESPONSIVENESS SUMMARY FOR THE PROPOSED PLAN FOR THE FINAL REMEDIAL ACTION FOR THE GROUNDWATER OPERABLE UNIT AT THE CHEMICAL PLANT AREA OF THE WELDON SPRING SITE

1 INTRODUCTION

This Responsiveness Summary Report provides responses from the U.S. Department of Energy (DOE) to comments received at the public meeting held on August 13, 2003, and to those received during the comment period for the Proposed Plan (from August 4, 2003, to September 3, 2003). The remainder of this report consists of two sections. Section 2 presents statements read at the public meeting and responses to questions that were asked at the meeting but were not answered at that time. These statements and questions were excerpted from the transcript prepared for the public meeting and are reproduced here. The entire transcript itself is included in the Administrative Record. Section 3 of this report presents responses to letters with comments that were received at the public meeting and letters that were mailed by September 3, 2003. These comment letters are also reproduced in this report to facilitate review of the responses.

To ensure that the focus of this Responsiveness Summary Report is on the Proposed Plan for addressing the groundwater at the Chemical Plant area, responses to comments that pertain to other operable units of the Weldon Spring site are being deferred to earlier responses provided to similar questions that are now part of the AR for these operable units.

2 STATEMENTS AND QUESTIONS EXCERPTED FROM THE TRANSCRIPT OF THE AUGUST 13, 2003, PUBLIC MEETING

Statements read by representatives of the Missouri Department of Natural Resources (MDNR), Missouri Department of Conservation (MDC), and U.S. Environmental Protection Agency (EPA) as shown on pages 22 to 36 of the meeting transcript were excerpted and are reproduced here as Section 2.1. Questions asked by various members of the public that were not answered verbally during the public meeting are summarized in Section 2.2 so that responses could be provided.

2.1 STATEMENTS BY MDNR, MDOC, AND EPA

time for the public comment.

But before we do that, we'd like to spend a little time and provide an opportunity for the regulatory community and state agencies to provide input on their thoughts on the proposed plan.

At this time, I'd like to introduce Mimi Garstang with the Missouri Department of Natural Resources for a comment from her organization.

Mimi.

MDNR Statement

MIMI GARSTANG: Thanks, Ray.

First of all, I want to thank so many of you who have taken the time to be here tonight. I think one of the most important things for staff that are here from the Missouri Department of Natural Resources is to listen to you tonight and hear what your concerns and what your comments are.

We, too, have prepared comments to present tonight. I wanted to admit that it's actual been difficult for me to put together comments tonight.

One reason is because, on one hand, I think we're really close to a good remedy to the contaminated groundwater at this site. However, on the other hand, I feel like that there are still too many unknowns, things that haven't been decided about the remedy that

MDNR (Cont.)

1 creates concerns for the Missouri Department of Natural
2 Resources. And I'm going to talk about that a little
3 bit more.
4 You realize that we're quickly approaching
5 the last record of decision at the Weldon Spring Site,
6 and I doubt if anyone is more anxious than the Missouri
7 Department of Natural Resources is to finish up the
8 good work that's been started here at the site.
9 Some of you are also aware that we have put
10 off the decision on the groundwater here. One reason
11 is because it is a complicated issue, and we want to
12 try to come up with the best remedy that's protective.
13 We wanted to make sure that a conservative
14 remedy is in place and a sound remedy to address the
15 groundwater contamination. First and foremost, we want
16 the plan to be protective of the people that live and
17 work and play near this site, as well as we expect the
18 plan to be protective of the St. Charles County and how
19 fast it is growing and will continue to grow in the
20 future.
21 And as a neighbor, we believe that the
22 Missouri Department of Conservation needs to feel
23 comfortable that there aren't unacceptable risks at
24 their property, and that people that use their property

MDNR (Cont.)

1 are not being faced with any unacceptable risks.

2 After listening to Tom's presentation, I know

3 you're aware now that the proposed plan leaves

4 contaminated groundwater at this site. Now our staff,

5 our technical staff at DNR, highly respect the

6 abilities and the knowledge of the technical staff that

7 work here at the Weldon Spring site, and we want to

8 work together with them to come up with the a good

9 solution. We, too, have very good technical in the

10 Missouri Department of Natural Resources.

11 Now both sets of technical staff agree that a

12 traditional groundwater remediation technology here at

13 this site is going to be very difficult because of the

14 complex geology and hydrology. We also agree that the

15 likelihood of it being totally successful, even if we

16 try it, is probably slim. And it's because of those

17 reasons that we have been willing to consider a passive

18 remediation of the groundwater or this concept of

19 monitored natural attenuation.

20 However, DNR can only consider supporting

21 this type of remedy under certain conditions. One

22 condition is that DNR become a full partner to a long-

23 term agreement for future decisions and management of

24 this site in the future. And we will continue to work

MDNR (Cont.)

1 towards that major goal with the Department of Energy
2 and EPA.
3 And we want to do this so that we can
4 properly represent the public's concerns well into the
5 future.
6 The other condition is agreeing to the
7 details of the sound monitoring plan with defined
8 contingencies to activate if the conditions worsen at
9 the site instead of improving.
10 The Department of Natural Resources noted
11 very early to the Department of Energy that monitored
12 natural attenuation for leaving the contaminant
13 groundwater in place to dilute and disperse on its own
14 would be an acceptable remedy only if we could agree on
15 the specifics of how to monitor this contaminated
16 groundwater to prove to ourselves, as well as prove to
17 you, that the groundwater conditions are clearly
18 improving and not getting worse.
19 All the technical staff do tend to agree that
20 we expect the groundwater to attenuate. But due to the
21 geologic and hydrologic complexities at this site, we
22 cannot make any assumptions. Instead we must collect
23 the proper data over time to prove that this remedy is
24 protective and not creating unacceptable risks.

MDNR (Cont.)

1 Nothing would please DNR anymore than if we
2 were standing in front of the public together with EPA
3 and DOE saying we are all agreeing and support
4 wholeheartedly a recommendation. And we are confident
5 that we can get to that point.
6 But I have to tell you tonight that we are
7 not there yet. We have previously prepared detailed
8 technical comments on the draft proposed plan
9 addressing our concerns. And so far most of them have
10 not been addressed in the final proposal.
11 Now I will not go through any of those
12 detailed comments tonight. I just want to give you an
13 example of one important issue. That issue is the
14 vertical depth of the TCE contamination has not yet
15 been identified. That has been in our comments, and we
16 believe that both the vertical and horizontal extent of
17 all contaminants must be identified before we are
18 comfortable that we're putting the proper institution
19 controls in place and that the groundwater is
20 attenuating properly. This is part of the data that we
21 must have to prove to you and to ourselves that this
22 remedy is truly protective.
23 We want you to know that the State is
24 committed to finalizing a sound remedy and record of

MDNR (Cont.)

decision for the groundwater at this site. We will do whatever it takes to resolve the outstanding issues.

However, as I said before, we will insist that this remedy is conservative and protective of the people that live, work and play near this site. We will continue to insist through our formal parlance on this proposed plan that a sound monitoring plan is in place to either prove or disprove that the remedy is performing as expected and a contingency plan is identified to activate if the remedy appears to fail or if the unexpected occurs.

DNR will also continue to actively pursue an official seat at the table for future site actions, decisions and oversight in the public's behalf.

All of you here tonight are well aware that it's going to take all of us working together as partners, not working against each other, to successfully institute the proper institutional controls and long-term surveillance need to keep this site safe well into the future.

I do want to thank the Department of Energy for allowing us to comment tonight. And I also want to encourage all of you to take advantage of this opportunity to let us know what your concerns and your

MDNR (End)

1 comments are.

2 Thanks.

3 RAY PLIENESS: Thank you, Mimi.

4 Another perspective from the State will come

5 from our neighbors, the Missouri Department of

6 Conservation, whose land is adjacent to ours.

7 Ms. Kathy Love will give their perspective.

MDC Statement

8 KATHY LOVE: Thank you, Ray, and thank

9 you, Pam, also, for making time on the agenda for us.

10 I'm just going to read a brief statement that

11 addresses our comments on the proposed plan.

12 The public can trust to the Missouri

13 Department of Conservation the care and management of

14 the land and its resources surrounding the Weldon

15 Spring Site Remedial Action Project. These public

16 areas, known as the

17 August A. Busch Memorial Conservation Area and the

18 Weldon Spring Conservation Area, are enjoyed by half a

19 million visitors per year.

20 As population and development continue to

21 grow in St. Charles and surrounding counties, this

22 expected public use of these conservation areas will

23 also grow. We take our responsibility to ensure the

24 safety and enjoyment of these visitors very seriously.

MDC (Cont.)

Groundwater underlying these two areas is an essential component of their resource health. Contamination that lasts for one hundred, five hundred or one thousand or more years compromises our ability to use the natural resources in a way that ensures our visitors' safety and health.

We are well aware of calculations that show little risk at anticipated exposure levels. However, we're also aware that such calculations may change with regard to specific contaminants, and the conditions over time may increase the exposure levels. All these factors require that groundwater contaminants be monitored and treated to the extent technology makes possible.

We will consider monitored natural attenuation an acceptable alternative under the following circumstances. If the state and federal agencies agree the groundwater remediation is not technically feasible at this time. If the state and federal agencies agree to revisit the issue as new technologies become available regardless of changes in exposure risks. If the state and federal agencies collect data that demonstrate to our agency and the public that the contamination is, in fact, not

MDC (Cont.)

spreading or affecting ecosystems on the Department of Conservation property.

Additionally we question the efficacy of several trigger points in the contingency action in the proposed supporting evaluation, and request the following monitoring practices be adopted.

When TCE levels exceed drinking water standards, five micrograms per liter, in any unweathered zone well, alternative remedial action should be initiated regardless of the TCE concentration in the plume.

The trigger point of twenty micrograms per liter as indicated in the document is unacceptable, and remedial action should not be dependent on contaminant levels in the plume.

Similarly, at Burgermeister Spring, active remedial alternatives should be implemented when TCE levels reach five micrograms per liter regardless of concentrations in the plume.

Fish tissue samples should be conducted annually to inform the public about the safety of fish consumption from the Department of Conservation lakes and the effectiveness of monitored natural attenuation.

At Burgermeister Spring, the trigger point

MDC (End)

1 for uranium should be 100 picocuries per liter not 300
2 as the document indicates. Additional monitoring of
3 wells whose number and placement coincide with
4 recommendations by the Missouri Department of Natural
5 Resources should be created to determine the current
6 vertical and horizontal extent of contamination and to
7 confirm plume locations and attenuation.
8 We would like to emphasize the need to
9 aggressively monitor groundwater contamination. By
10 allowing contaminated groundwater to continue to spread
11 to this high public use area, the Department of Energy
12 is effectively removing the value of the groundwater
13 resource from the Conservation Department property.
14 We respectfully request that the proposed
15 plan for final remedial action for the groundwater
16 operable unit, that the chemical plant areas of the
17 Weldon Spring Site be revisited with these concerns in
18 mind.
19 Thank you for the good progress made to date
20 and your willingness to address and resolve remaining
21 contamination problems.
22 RAY PLIENESS: Thank you, Kathy.
23 The regulator that responds directly to those
24 things we need to do on this site is the EPA. The EPA

EPA Statement

1 is going to provide a comment this evening. That
2 comment will be presented by Mr. Dan Wall.
3 Dan.
4 DAN WALL: Thank you, Ray.
5 Hello, everybody. I've been associated with
6 the Weldon Spring site for roughly eighteen years now.
7 So I know many of you pretty well. And I know quite a
8 bit about the site, both past and present.
9 My job as a representative of EPA is to stay
10 engaged on the project and ensure that the DOE conducts
11 activities that are consistent with what's required
12 under the law, the National Contingency Plan and
13 program expectations.
14 I also occasionally offer some welcome input,
15 and it's hard to comprehend that this somewhat, thin,
16 unimposing plan actually has fifteen years of study and
17 analysis behind it. We've been gathering -- or DOE has
18 been gathering data out there. As I say, folks, you
19 know, on groundwater for a good fifteen years or so.
20 We've got -- been monitoring literally hundreds of
21 monitoring locations.
22 There's been a thorough analysis for
23 prospects for accumulative technology that involves,
24 aquifer testing, have technology vendors to come in and

EPA (Cont.)

1 discuss prospects of their technologies. There was
2 scale testing, pilot testing and such. Tom went over
3 most of that.
4 And the reason I bring that up, the point I'm
5 trying to make is that this is not really a snap
6 decision or a decision that resulted from foregone
7 conclusion or anything like that. It's really a highly
8 considered proposal. And the result of that is that I
9 think EPA is prepared at this point to agree that the
10 monitored natural attenuation solution in the form
11 presented, scoped out here in this proposal is the
12 appropriate and reasonable approach.
13 I guess I'd like to address what I sort of
14 see as a misconception. I could be wrong, but maybe
15 I'm overinterpreting. But this is not a decision to do
16 nothing. It's not a decision to forego active
17 remediation.
18 It is the decision, it is a judgment, and it
19 represents a judgment that the active remediation
20 methods, pump-and-treat, that were tested out were not
21 particularly effective, were not effective for what I
22 will call a full-scale deployment. The hydrogeology is
23 not particularly suitable for these types of
24 techniques.

EPA (Cont.)

1 The other thing to consider is that it's
2 localized or limited deployment for these sorts of
3 actions and are not expected to have a measurable
4 impact on the capacity to achieve the remediation goals
5 over time. So, in effect, they don't meet a cost
6 effect as a test.
7 You could apply some of them, both the
8 localized areas, you would still be faced with same
9 long-term management problem. And I guess I would also
10 add that's not an unusual situation. The Weldon Spring
11 site is not unique in that regard. I would say that
12 most, if not virtually all, hazardous waste site
13 cleanups involve groundwater remediation. Even those
14 where it involves sandy aquifers and conditions where
15 treatment is considered effective, are left with a
16 residual condition that often needs to be managed for
17 the foreseeable future and beyond.
18 So no one should think that this is an
19 inferior approach simply because we have residual that
20 needs to manage for the foreseeable future.
21 I think it's -- we're fortunate in this case
22 that that long-term management is doable. There is no
23 -- the sources of the contamination have been removed,
24 so there's no ongoing contribution to the groundwater.

EPA (Cont.)

1 We don't have non-aqueous phase, contaminant plumes
2 that will continue to lead to groundwater contamination
3 for years.
4 So we're really looking at a situation that
5 we expect to be defined from here in terms of it being
6 a problem. We don't -- I don't see potential for
7 significant exposure to the general public under
8 current land use and groundwater use conditions.
9 There's no particular pressure to use that impacted
10 groundwater for drinking water purposes or for other
11 uses that might cause exposure.
12 Most of the impacts are on public land, which
13 makes it relatively easier to implement institutional
14 control, although those are always problematic.
15 I guess that's the majority of the points I
16 wanted to make. I think this is a good plan. It
17 should be pointed out that this is a plan in concept.
18 We fully expect to continue to work on this sort of
19 thing as Mimi was discussing. There will be a record
20 of decision process. There'll be the comment.
21 There'll be the process of addressing the comments that
22 are received here, and there'll be a remedial design
23 and remedial action development process that will
24 follow.

EPA (End)

So we expect to have the opportunity to continue to work through the specifics of how this plan will be developed.

And with that, I guess I'd like to thank all the stakeholders that have participated. The Department of Energy, the Department of Natural Resources, the Department of Health, Department of Conservation, the Citizens Commission, the St. Charles County Government. Hope I didn't leave anybody out because I really believe that people paid more than just lip service to the concept of cooperation here. I think we worked through a true -- and it's a truly successful consensus process. And I expect it'll continue through the design and we'll be able to get resolved the issues that the State has with how this plan will be carried out.

That's all I have.

RAY PLIENESS: Thank you, Dan.

With that, I'd like to get on with providing opportunities for the public to have their comments. I'm going to go over the stenographer again. The reason we transcribe this particular meeting is it does become part of the public record so that anybody can read it, understand who said what. The transcript is

2.2 FOLLOW-UP RESPONSES TO QUESTIONS ASKED AT THE PUBLIC MEETING

This section presents a list of questions that were asked by various members of the public at the meeting held on August 13, 2003 but for which responses were deferred to this responsiveness summary.

1. "How was it determined that Twin Island Lake was not degraded by the DOE sites, the well there." (page 61 of transcript)

Response:

Sampling performed by the Department of Energy and the Missouri Department of Health and Human Services at the Twin Island Lakes wells have indicated uranium levels less than 1 pCi/l. Also, nitrate concentrations in these wells were less than 0.1 mg/l. Nitrate, a very mobile contaminant, is considered a signature of contamination associated with the raffinate pits.

2. "But my biggest comment is regarding the feasibility of looking at, now that the points are made that the groundwater flows in the upper surface areas to the Burgermeister Spring, is let's look at the possibility of using that site to consider the feasibility of long-term remediation at that location, using both active and passive means." (page 62 of transcript)

Response:

The uranium levels in both Burgermeister Spring and Lake 34, while greater than background, do not pose a risk to the recreational users of the area or the ecological system. Levels of uranium in both the spring and the lake have decreased over time because of the cleanup of uranium contaminated soil at the chemical plant. Monitoring of the groundwater and springwater over time will verify that levels continue to decrease due to attenuation of the remaining contamination in groundwater. In one sense, Lake 34 already provides passive natural attenuation due to the dilution effect of this large body of water. No additional attenuation measures are warranted.

3. "Is the remedial action plan written in stone, or is it a living document that can be amended if contingencies arise by reconvening various agencies to deal with problems?". (page 63 of transcript)

Response:

The remedial action plan is drafted by DOE and reviewed by the regulatory agencies. It is then revised by DOE and reviewed again by the regulatory agencies. When it is finalized, it is implemented. Some contingency activities will be included in the plan, but if unforeseen circumstances arise, which pose the potential to doubt the protectiveness of the remedy, then these circumstances will be reviewed by DOE and the regulatory agencies. If changes are needed, the public will be involved as prescribed by CERCLA.

4. "Could you show in your report the extent of the public lands that are surrounding this? I don't remember seeing it anywhere in these reports. You do show the extent of the DOE lands." (page 77 of transcript)

Response:

Surrounding landowners that are included within the IC area will be depicted in the figure in the ROD before it is finalized.

5. "Are the lakes tested for any --". (page 79 of transcript)

Response:

Busch Lakes 34, 35, and 36 are sampled semiannually for uranium.

6. "Now wouldn't it make sense since the plume of surface water contamination from Burgermeister Spring flows directly into Lake, you know, 34, for one to expect that uranium inundates Lake 34? Yes or no." (page 80 of transcript)

Response:

Uranium levels in Lake 34 ranged from 1.0 pCi/l to 4.5 pCi/l in 2002. Spring water discharging from Burgermeister Spring has elevated levels of uranium ranging from 8.6 pCi/l to 100 pCi/l during 2002. This springwater flows to a tributary that enters at the top of Lake 34.

7. "Have you looked at all of the water of Busch Wildlife Area to see if, in fact, there's a plume, albeit below background, of contamination of uranium within the waters? That's the point I was trying to make about the springs that are shown on the map. Your spring, Burgermeister Spring, is showing a higher level of uranium.

But to look at the local background, you should not look at what USGS determined in Darst Bottom." (page 82 and 83 of transcript)

Response:

Uranium in groundwater does migrate from the chemical plant to Burgermeister spring, primarily through preferential flow features (paleochannels). Wells on the Busch Conservation property between the chemical plant and the spring indicate uranium levels up to 1.8 pCi/l, which are greater than background (0.93 pCi/l).

Background concentrations in groundwater were determined during the Remedial Investigation. It was necessary to use existing on-site wells to estimate background levels of naturally occurring constituents. Several wells open to the Burlington-Keokuk Limestone were identified as potential background locations since these areas had not shown detectable nitroaromatic compounds (a key contaminant at the training area) and were not impacted from historical source areas. The background monitoring wells were selected on the basis of (1) completion in similar

hydrostratigraphic unit (e.g. weathered or unweathered), (2) location outside of areas directly affected by contamination from the chemical plant area, and (3) location upgradient or at a distance from explosive production areas. The background level of uranium in the weathered Burlington-Keokuk Limestone was determined to be 0.93 pCi/l.

3 COMMENT LETTERS RECEIVED DURING THE COMMENT PERIOD

Thirteen comment letters were received during the comment period of August 4 through September 3, 2003. Table 3.1 presents a tabulation of the parties that submitted comments included in this section.

TABLE 3.1 Comment Letters Received during the Comment Period

Letter Identifier	Commentor	Affiliation/Address
A	Dr. Michael V. Garvey	208 Pitman Hill Rd. St. Charles, MO 63304
B	Kay Drey	515 West Point Ave. University City, MO 63130
C	Daniel W. McKeel, Jr., M.D.	5587-C Waterman Blvd. St. Louis, MO 63112
D	Daniel W. McKeel, Jr., M.D.	5587-C Waterman Blvd. St. Louis, MO 63112
E	Louise McKeel	*Village Image News* St. Louis, MO 63112
F	Weldon Spring Citizens Commission	7295 Highway 94 South St. Charles, MO 63304
G	Weldon Spring Citizens Commission	7295 Highway 94 South St. Charles, MO 63304
H	Mimi R. Garstang Missouri Dept. of Natural Resources	11 Fairgrounds Road Rolla, MO 65401
I	John D. Hoskins Missouri Dept. of Conservation	2901 W. Truman Blvd. Jefferson City, MO 65102
J	Kay Drey	515 West Point Ave. University City, MO 63130
K	Virginia Dowden	League of Chambers 10 Hobie Cat Drive Defiance, MO 63341
L	Karl Daubel	15022 Willow Lake Ct. Chesterfield, MO 63017
M	Dr. Michael V. Garvey	208 Pitman Hill Road St. Charles, MO 63304

Chemical Plant Groundwater Operable Unit Public Meeting
Question Submission Form

August 13, 2003
Weldon Spring Site, St. Charles, MO – Interpretive Center

A You may use this form to submit questions or comments to be addressed during the Public Question and Comment Period of this meeting. Oral questions will also be accepted at that time. Please return completed forms to the question box by the meeting room entrance or submit to Wendy Drnec or Wendee Ryan.

See ATTACHED COMMENT of 8-13-03

Name (optional): MICHAEL V. GARVEY

Written Comment for Public Meeting 8-13-03
Pam Thompson,Site Manager
DOE
Weldon Springs Remedial Action Project
7295 Hwy 94 South
St. Charles, MO. 63304

From: *Dr. Michael V. Garvey*
208 Pitman Hill Rd.
St. Charles, MO. 63304

RE; PUBLIC COMMENT FOR GROUNDWATER, SPRINGS PROPOSED REMEDIAL ACTION OF AUG. 2003

8-13-03

Dear Pam. Thompson,

A-1 I appreciate all the excellent work of the DOE and it's subcontractors and the MoDNR over the years to greatly improve the local conditions, as they may impact the public health of local residents. The St. Charles residents are grateful, but still concerned with the long term potential for some unexpected loss of intregrety of the disposal cell and the contaminated ground water and surface water left after the active remediation. Please keep me in the loop regarding the stewerdship of the site and the results of the sampling of the springs, disposal cell and of course the St. Charles County Well Field as long as it is in use for a drinking water supply. Hopefully the St. Charles County Well Field source for drinking water will not be needed in the immediate future as alternate supplies exist now to feed PWD #2.

Below are my formal comments to be used regarding thre proposed remediation of the groundwater and springs of the Site. My chief concern is found below in #1.

A-2 1. Because it has been fully documented that most of the contaminated shallow groundwater beneath the chemical plant area discharges to the surface in the vicinity of Burgermeister Spring and that according to the DOE no active remediation is reasonable closer to the chemical plant site; and that the surface water uranium concentrations in this spring is greater than the groundwater under the chemical plant: **the DOE should consider the feasibility of long term remediation of the surface water at that location.** Please address this request in writing in your final evaluation and recomendations. This contamination has for too many years been allowed to continue to degrade the St. Charles Counties surface waters and ground waters (ie Dardenne Creek and ponded waters ie. Lake 34 at Busch WLA).

A-3 2. As I mentioned too many years ago, long term storage should not have been placed at Weldon Springs, an area with groundwater contamination and a

Response A-1: This commenter, as well as others that have expressed interest in being kept informed, is on the site's distribution list for major documents such as the Long Term Surveillance and Maintenance Plan and the Annual Site Environmental Report. This list is updated periodically. Up to date monitoring information, as well as historical documents, are available on the internet at www.gjo.doe.gov/programs/ltsm.

Response A-2: The uranium levels in both Burgermeister Spring and Lake 34, while greater than background, do not pose a risk to the recreational users of the area or the ecological system. Since there is no risk, removal of the uranium from the water can not justified. Levels of uranium in both the spring and the lake have decreased over time because of the cleanup of uranium contaminated soil at the chemical plant. Monitoring of the groundwater and springwater over time will verify that levels continue to decrease due to attenuation of the remaining contamination in groundwater.

Response A-3: In accordance with applicable regulations, the groundwater monitoring wells that have been installed to monitoring for impact from the disposal cell are screened in the uppermost aquifer (i.e. Burlington-Keokuk Limestone). The screened intervals were selected based on borehole tests designed to identify the zones where the most rapid groundwater movement may occur (i.e., zones of highest hydraulic conductivity). More information regarding the cell monitoring program can be found in the LTS&MP.

A-3 cont. complex hydrogeology, springs, highly fractured limestone with solution voids, enlarged fractures and karst features with **rapid** groundwater transport. Monitoring the long term intregrity of the disposal cell will be more difficult due to the groundwater contamination under the cell in this heterogeneous, highly fractured groundwater medium, with poorly connectioned voids which may hold contamination. (What is the design and screened intervals of the new Cell Detection Monitoring Wells?)

A-4 3. The Institutional Controls Location map on page 14 Figure 4 seems artifically drawn to include only chemical plant and the two springs SP-6303 PR-6301, it is too small an area! (How was it determined that the wells at Twin Island Lakes were not degraded by the the DOE Site? What are the results of the sampling of the other Perennial Springs seen in Figure 3 page 6. Perhaps if the groundwater flow from the plant site is to the north, some of these spring surface water results to the southwest could be used to determine the spring water quality local background levels? Where can one find the Missouri Dept. of Health private drinking water well results?)
Public comment 8-13-03 Dr. Michael V. Garvey cont.

A-5 4. Will signage at the springs (6301 & 6303) and the southeast drainages be placed and maintained to warn the public not to drink the water? Should bottom feeding fish be digested from Lake 34 at Busch WLA without some information regarding the potential bioconcentrations? I recommend that at the least a catch and release policy should be in place at Lake 34,35,&36 at Busch WLA and the Upper and Lower Femme Osage Sloughs at the Weldon Springs WLA.

A-6 5. What if it takes over 100 years to achieve drinking water standards and if the MCL for Uranium is lowered in the meantime? How was it determined to be 100 years?

Sincerely,
Dr. Michael V. Garvey
208 Pitman Hill Rd.
St. Charles, MO. 63304
mgarvey@garveyteam.com

Response A-4: Institutional controls will be implemented to prevent groundwater usage for any purpose. The boundary where the institutional control(s) will be implemented will be the property boundary of the chemical plant plus any area outside the property boundary where the MCL is exceeded for any of the contaminants of concern and also within a buffer established around the boundary where contaminant concentrations exceed the applicable MCL. This buffer will delineate an area where groundwater extraction cannot be performed, not because of groundwater quality, but because of the possibility of intercepting the groundwater plume in the area of influence of a well.

The buffer will extend 1,000 ft. from the edge of the contaminant plumes as delineated on Figure 4 of the Proposed Plan. This distance is based on data from two groundwater studies performed at the site during 1998 and 2001. The area of hydraulic capture around a hypothetical well was estimated to be 600 to 1,000 ft. This is based on information from MW-3028 and is considered to be conservative since it is located in a more transmissive portion of the aquifer.

The results of MDNR-DGLS investigations indicate that a subsurface conduit is present between the unnamed tributary of Schote Creek and Burgermeister Spring. Overland flow from the northwestern portion of the chemical plant is lost in a losing reach of an unnamed tributary of Schote Creek about 1,000 ft northwest of Ash Pond. The travel time to Burgermeister Spring, which is located approximately 6,500 ft away, was estimated to be 48 to 72 hours, depending on previous rainfall. Dye tracing of two angled borings and one monitoring well, which were selected for high hydraulic conductivity, was performed during the remedial investigation. Three springs in the 6300 drainage were monitored for resurgence of the dye; however, the dye was only detected in Burgermeister Spring. Dye was initially detected in Burgermeister Spring 2 to 7 days after injection.

Institutional controls will be implemented to prevent groundwater usage within the preferential flow path for any purpose. The boundary where the institutional control(s) will be implemented will extend 1,000 ft around the known area of groundwater impact (where the MCL is exceeded for any of the contaminants of concern) along a straight line to Burgermeister Spring.

Sampling performed by the Missouri Department of Health and the DOE at the Twin Island Lakes wells have indicated uranium levels less than 1 pCi/l and nitrate concentrations less than 0.1 mg/l. These levels are below their respective MCLs.

Three springs in the Burgermeister Spring Branch (SP-6301, SP-6303, and SP-6306) and two springs in the Southeast Drainage (SP-5303 and SP-5304) are routinely monitored by the DOE. Fifteen springs (inclusive of the 5 previously mentioned) were characterized during the remedial investigation performed in 1995. Uranium levels were similar to background for the weathered Burlington-Keokuk Limestone (0.93 pCi/l) in all the springs except for Burgermeister Spring, SP-6303, and the Southeast Drainage Springs.

Background data for the weathered Burlington-Keokuk Limestone was used as background comparisons for the springs. Because springs represent locations of groundwater discharge to the surface, the groundwater data collected from the background groundwater monitoring wells

(Response A-4 cont.)

completed in the weathered zone of the Burlington-Keokuk Limestone were selected to present background spring data.

Due to confidentiality issues, inquiries should be directed to the Missouri Department of Heath and Senior Services for data from their monitoring program.

Response A-5: DOE does not recommend warning signage as a component of this remedy. As indicated in the Proposed Plan and previous risk assessments, a recreational user of spring water on Conservation property would not be subject to an additional unacceptable risk due to site contaminants. Likewise, consumption of fish from the Busch Lakes does not pose an unacceptable risk as determined from uptake studies and risk assessments conducted under the worst case exposure conditions. Therefore warning signs or catch-and-release policies are not warranted due to site contaminants. The Missouri Department of Conservation, in consultation with the Missouri Department of Health and Senior Services, assesses fish contaminant uptake throughout the State and determines when and how to issue specific warnings about specific risks.

Response A-6: Changes in the MCL (increase or decrease) are evaluated under the 5-Year Review process. An evaluation of the protectiveness of the remedy in light of any change to the applicable regulations is required under CERCLA during each review.

The estimation of the timeframe for each contaminant to attenuate to the applicable MCL is presented in the supporting evaluation document. Dissolved contaminants in the groundwater beneath the Chemical Plant area would primarily move in the direction of natural groundwater flow and be reduced though dilution by recharge from precipitation and dispersion in the groundwater. Timeframe estimates were made by determining the number of volumes of impacted water that would have to flush through the system in order to reduce to the applicable MCL.

B.

8/14/03

Pam—

I would appreciate it if someone would please attach this cover and page 21 to the IAEA pages I gave you last night. Thanks—

Kay

TECHNICAL REPORTS SERIES No. 15

A Basic Toxicity Classification of Radionuclides

DEGREE OF ACUTE TOXICITY
OF A GROUP OF RADIONUCLIDES
TO MAN

INTERNATIONAL ATOMIC ENERGY AGENCY

INTERNATIONAL ATOMIC ENERGY AGENCY - VIENNA 1963

TABLE I

RADIONUCLIDES ARRANGED IN ORDER OF THEIR MOST RESTRICTIVE $(MPC)_a$ VALUE

→ HIGH TOXICITY

Pa^{231}, Cf^{249}, Pb-Nat, Pa^{239}, Ar^{260}, Pa^{242}, Th^{228}, Pu^{238}, Ac^{227}, Th^{230}, Np^{237}, Th^{228}, Am^{241}, Am^{243}, Cm^{243}, Cm^{245}, Cm^{246}, Cf^{250}, Cf^{252}, Cm^{244}, U^{232}, Ra^{226}, Ra^{228}, Sm^{147}, U-Nat, Nd^{144}, U^{238}, Pu^{241}, Pa^{230}, U^{230}, U^{233}, U^{234}, U^{235}, U^{236}, Cm^{242}, Th^{227}, Pa^{230}, Ra^{223}, Sr^{90},

MEDIUM TOXICITY

Upper Sub-Group A

Ra^{224}, Pa^{230}, Bi^{249}, I^{128}, Ba^{134}, Ru^{106}, Ce^{144}, Bi^{210}, At^{211}, Na^{22}, Co^{60}, Ag^{110m}, I^{126}, I^{131}, Cs^{134}, Eu^{152}(13y), Cs^{137}, Bi^{207}, Pb^{212}, Ac^{228}, In^{114m}, Sb^{124}, Te^{123}, Cl^{36}, Sc^{46}, Sb^{125}, Ir^{192}, Tl^{204}, Ce^{95}, Mo^{99}, Y^{91}, Zr^{95}, Sr^{89}, Cd^{115m}, Sn^{113}, Te^{127m}, Te^{129m}, I^{129}, Eu^{149}, Tb^{160}, Tm^{170}, Hg^{203}, Tb^{154},

Lower Sub-Group B

P^{32}, V^{48}, Fe^{59}, Co^{58}, Ni^{63}, Zn^{65}, Nb^{95}, Ru^{97}, Tc^{99}, Cd^{109}, Sn^{113}, Pm^{147}, Sm^{151}, Os^{185}, Hg^{203}, As^{76}, Y^{90}, Zr^{97}, Mo^{93}, Rh^{103}, Ag^{105}, Sn^{125}, Cs^{136}, Eu^{155}, Gd^{153}, Bi^{212}, K^{42}, As^{74}, Se^{75}, Sr^{85}, Nb^{93m}, Zr^{93}, Te^{125m}, Te^{132}, I^{133}, La^{140}, Tm^{171}, W^{181}, W^{185}, Na^{24}, Sc^{48}, Mn^{52}, Y^{90}, Tc^{97m}, Sb^{122}, Ce^{141}, Pr^{142}, Re^{183}, Ir^{194}, Sr^{89}, Ca^{47}, Co^{57}, Ga^{72}, Br^{82}, Cd^{115}, Te^{131m}, Cs^{135}, Ir^{193}, Ho^{166}, Er^{169}, Pa^{233}, Mo^{99}, Ce^{143}, Dy^{166}, Tc^{96}, Ag^{111}, I^{132}, Nd^{147}, Pm^{149}, Re^{186}, Au^{198}, Tl^{202}, S^{35}, Se^{81}, Os^{193}, Zn^{69m}, As^{73}, As^{77}, Sr^{92}, Y^{92}, Tc^{97}, Ni^{59}, Ru^{131}, Sm^{153}, Eu^{152}(9.2h), Gd^{159}, Er^{169}, W^{187}, Os^{191}, I^{130}, Pt^{193}, Rn^{222}, Ra^{222}, * Sc^{47}, Mn^{56}, Ni^{63}, Ni^{65}, Kr^{87}, Ru^{105}, Rh^{105}, I^{134}, Er^{171}, Yb^{175}, Lu^{177}, Ga^{67}, Pt^{191}, Pt^{197}, Au^{198}, Np^{239}, Si^{31}, Fe^{55}, Pd^{103}, Te^{127}, Au^{199}, Hg^{197m}, Tl^{200}, Tl^{201}, Br^{7}, Al^{28}, Cu^{64}, Hg^{197}, Th^{234}, Nd^{149}, Ru^{97}, In^{115m}, Pb^{203}, Cl^{38}, Dy^{165}, Cr^{51}, F^{18}, C^{14}, Kr^{85m}, Te^{129}, Xe^{133}, Cs^{131},

LOW TOXICITY

H^{3}, Zn^{69}, Ge^{71}, Nb^{97}, In^{113m}, Cs^{134m}, Pt^{193m}, Pt^{197m}, Tc^{99m}, Co^{58m}, Kr^{85}, Xe^{133}, Cs^{131m}, Xe^{131m}, Y^{91m}, Sr^{85m}, Tc^{96m}, Rh^{103m}, A^{37},

* The figure used for this isotope is the same as that given in Basic Safety Standards for Radiation Protection [1].

The Department of Energy's Proposed Plan for the Groundwater at the Weldon Spring Chemical Plant Area — a public meeting at the W.S. Interpretive Center. August 13, 2003.

My name is Kay Drey. I live in University City. No doubt the U.S. Department of Energy's primary contractor for the Weldon Spring Site remediation would like to finish packing up and closing down the last traces of its Weldon Spring assignment. But those of us who live nearby, or downstream and downwind, do not have the option of walking away from the Weldon Spring environment. We will be breathing its air and drinking its water for the rest of our lives. That's why tonight's meeting is so important.

If the Department of Energy is allowed to leave radioactive uranium and thorium and their daughter products in the terrain that lies beneath this site, the groundwater that flows from Weldon Spring, into the Missouri and Mississippi rivers, upstream from St. Louis — that groundwater will continue to pick up and disperse these toxins into our biosphere. For as long into the future — billions of years — as anyone here can imagine, and beyond. I wish I knew how many times I have said or written that same warning over the past 25 years.

We have been hearing recently about the hazardous health effects our U.S. troops have experienced from exposure to depleted uranium munitions used during the two Gulf wars. To quote from a speech last month by the former director of the Army's depleted uranium project: uranium dust is so fine that it acts like a gas, seeping through the tiny pores of protective masks. "It contaminates air, water and soil for all eternity." (Buffalo News, New York. July 22, 2003)

B-1 (quoting from the "Supporting Evaluation for the Proposed Plan," August 2003): If as predicted, uranium that remains radioactive for billions of years could be sorbed by sedimentary material and plants in the springs (p. 57), how, then, is it possible that the levels of uranium could meet federal and state standards in the time frame predicted by the DOE — namely, from 4 to 80 years? (p.59) Is it reasonable to expect that uranium will remain attached in perpetuity to the surfaces of vegetation growing in and along rapidly flowing spring water, or is it not likely that some of the uranium would be released in plumes or clumps — to be "transported in both dissolved and particulate forms" ? (p.14) Could the organic materials to which the uranium is adsorbed cause the dissolution of the uranium — similar to chelating agents — thus accelerating the migration rate of the uranium?

B-2 The proposed plan clearly states that "no reduction of toxicity, mobility, or volume through treatment would be accomplished because the contaminated groundwater would not be treated." (p.59) Then, as downstream water consumers, we can only urge you to be as forthright as possible in explaining that our generations alive today, and those in the future, will continue to be exposed to the Weldon Spring uranium, thorium, radium, radon, polonium, actinium, protactinium — in concentrations and with impacts on health that cannot be accurately monitored or predicted, and most probably cannot be naturally attenuated to levels assessed, by future scientists and physicians, to be safe or even permissible. (I am submitting two lists of radionuclides that indicate their comparative radiotoxicity — that show we have many of the most dangerous radioactive materials here at Weldon Spring.)

→

Response B-1: The attenuation of uranium is based on its concentration, not on radioactive decay. Desorption of uranium from the aquifer materials is expected and was taken into account in the estimations of the attenuation timeframes.

Response B-2: The DOE believes it has been forthright in explaining the extent of groundwater contamination at the site and has demonstrated that there will be no impact to downstream water consumers. The toxicity of radionuclides present at the Weldon Spring site is well known, as demonstrated by the development of maximum permissible concentrations (MPCs) in air and water. That is, various scientific organizations including the International Atomic Energy Agency have studied the toxic effects of radionuclides and identified protective concentrations for workers and members of the general public under various exposure conditions. The radionuclides at the Weldon Spring site are naturally occurring and are present in low concentrations in soil, surface water, and groundwater throughout the country, including at locations downstream of the Weldon Spring site. The incremental contribution of radionuclides from the Weldon Spring site at locations occupied by downstream water consumers will be immeasurably small and not constitute a health concern under any foreseeable situation.

B-3 As I understand it, natural attenuation is a process usually relied upon for volatile organic compounds, for substances that break down into various degradation products — a progression that will take virtually forever for some of the radioactive materials at Weldon Spring. Thorium-230 has a half-life of 75,000 years; uranium-238's half-life is 4.5 billion years; and thorium-232 has a half-life of 14 billion years. Are you really asking us to wait forever — while these materials continue giving off radioactive particles and rays — for uranium and thorium to "naturally attenuate"? Are your monitoring tools and wells even going to last that long?

B-4 And if the concentration levels of the contaminants remain greater than the currently established standards, are we not entitled to a contingency plan more realistic than merely providing for "additional fish sampling at Lake 34" in Busch Conservation Area, and some additional monitoring? (p.57)

B-5 The proposed plan is to wait for the radioactive wastes to dilute and disperse themselves somehow, at some point, in the unknown future. I believe that Monitored Natural Attenuation — walking away from the contaminated groundwater — in this heterogeneous, complex hydrogeology is not a proposed action, but is instead, I believe, a proposed inaction.

Thank you.

Kay Drey
515 West Point Ave.
University City, MO 63130

Response B-3: Natural attenuation is a process relied upon not only at sites with volatile organic compound contamination, but also at sites with metals, such as uranium, and other contamination. The timeframe for uranium to decrease to the MCL has been estimated to be less than 100 years. It is feasible for the monitoring tools to last the estimated timeframe if properly maintained. Also see response to comment B-1.

Response B-4: Should an alternative to MNA be needed, it will be implemented in accordance with the CERCLA process for post-ROD changes. If the remedy requires immediate action, a time-critical removal will be conducted in accordance with CERCLA. Alternatives to MNA will be reevaluated and will include ICO as well as other treatment or containment technologies that may be available in the future.

Response B-5: Comment noted.

TABLE 3.2 is a tabulation of other materials submitted by Kay Drey at the public meeting.

TABLE 3.2 Submittals from Kay Drey

B-6

Item
New York Times Article, March 23, 1998
Letter to Ms. Pamela Thompson, February 28, 2001
Letter to Mr. Larry Erickson, February 7, 2001
Letter to Mr. Stephen McCracken, August 15, 2000
Letter to Mr. Steve McCracken, June 30, 2000
Letter to Mr. Robert Geller, November 16, 1999
Question regarding Conquista Project
Letter to Mr. Stephen H. McCracken, September 1, 1999
Letter to Mr. Stephen H. McCracken, May 27, 1999
Amer. Industrial Hygiene Assoc. Journal Article, May-June 1965
International Atomic Energy Agency Radionuclide Table

Response B-6: Previous letters to MDNR and DOE with accompanying literature and news media exerpts have been previously addressed and are included again here since they were resubmitted during the public comment period. These materials will also be available in the Administrative Record for the GWOU.

Chemical Plant Groundwater Operable Unit Public Meeting
Question Submission Form

August 13, 2003
Weldon Spring Site, St. Charles, MO – Interpretive Center

You may use this form to submit questions or comments to be addressed during the Public Question and Comment Period of this meeting. Oral questions will also be accepted at that time. Please return completed forms to the question box by the meeting room entrance or submit to Wendy Drnec or Wendee Ryan.

C-1 I have prepared comments that include several specific questions related to the PP for Chemical Plant GWOU.

Q1 - How much is cost ~~[illegible]~~ containment a factor in choice? ALT. 3

Q2 - What about additional active treatments (Fort Lewis WA) - why cannot they be used. Fort Lewis says baseline TCE in 40 years.

Q3 - Is MDNRs oversight role being compromised by shortage of long-term funding from DOE?

Name (optional): Dan McKeel MD 8-13-03

In addition to Oral + Written comments.

Response C-1: Cost containment was not a factor in selecting Alternative 3. This alternative is the most costly of the three presented. Active remedial actions were determined to be technically ineffective and therefore a cost could not be assigned. A comparison to Fort Lewis is discussed in the response to comment C-4. DOE does not believe MDNR's oversight role to be compromised.

Comments on the
"Proposed Plan for Remedial Action
for the
Groundwater Operable Unit
at the
Chemical Plant Area
of the Weldon Spring Site,
Weldon Spring, Missouri"
dated August 2003

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Public Meeting August 13, 2003
Weldon Spring Interpretive Center

by

DANIEL W. MCKEEL, JR., M.D.

(Option to amend and extend these remarks
during the August 4 - September 3 comment period
based on the discussion at the 8/13 meeting)

See 3 questions on Blue Card

Contact Information:
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ORAL COMMENTS
Daniel W. McKeel, Jr., M.D.
August 13, 2003

C-2 1. Like the original August 9, 2003 LTSM document, this PP is too brief and lacks many essential details. It, too, appears to be very premature and incomplete. In particular, the sections on pages 14-15 dealing with triggers and contingency plans where DOE and MDNR differ totally lack specifics. Examples: (a), page 15, "Within the plumes, the trigger concentrations will be representative of historical highs"; (b) At the springs, the trigger concentrations will consider health-based values and historical trends." This type of wording is so vague that no regulatory or sicientifc meaning flows from it – what are "health-based values", for instance? How will historical highs actually be used to set triggers?

C-3 2. There has been no opportunity thus far for general public comments on the process whereby remediation alternatives have been selected. As a result...

C-4 3. **The three chosen Alternatives do not encompass all reasonable, tested scientific options.** I favor a Fourth Alternative, active treatment based on latest technology, using the GW remediation at the Fort Lewis, Washington Superfund Site as a model to achieve unrestricted use in 40 years versus the preferred Alternative 3 that will take 100 years to comply with ARARS.
• **I have the perception that cost and time were given undue consideration over protecting the public health and the environment.** These are goals that DOE, EPA and MDNR all endorse on paper but do not fully support as judged by the weak groundwater remediation efforts over the past several years since the public demanded remediation be attempted. Judged on performance achieved, a low performance score is merited based on the pilot study results.

C-5 4. I offer as proof of statement [2] the selected groundwater remedy chosen at the Fort Lewis, WA Superfund site where uranium and TCE are also major COCs. There, multiple innovative GW treatment options are being employed to reduce the original estimate to return the site to unrestricted use from 60 to 40 years. Alternative 3 offered in the PP for Weldon Spring will take 100 years to satisfy all ARARS, an *unacceptably long period of time.*

C-6 5. The **Interceptor Trench design** was poorly engineered from the outset so that only only one of three sump pumps removed significant uranium-bearing groundwater. The excuse offered that the two year test period was especially dry (low rainfall) is not valid. Weather conditions in this area could have been forecast more accurately and a design made that allowed all 3 pumps to operate effectively. This was not done, and EPA, DOE and MDNR in concurring on the design and its implementation are at fault for not giving this proven and establsihed remediation technology a better try.
• In addition, the initial amount of total uranium burden was recalculated from 85 to 1450-2380 kg near the end of the two year trial period. Using the original

Response C-2: As defined in *A Guide for Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (OSWER 9200.1-23P), the Proposed Plan is a document used to facilitate public involvement in the remedy selection process. The document presents the preliminary recommendation (preferred alternative) concerning how best to address contamination at the site, alternatives that were evaluated, and explains the reasons the preferred alternative has been recommended. The Proposed Plan is a concise, easy-to-read synopsis of the proposed action and is supported by the RI/FS package that has been prepared for the GWOU and made available to the public for review along with the Proposed Plan. This practice is consistent with that observed for previous Proposed Plans issued for review by DOE. It is a communications tool required under CERCLA as a means of informing the general public about the alternatives considered and the preferred remedy.

The Proposed Plan does not present the complete design for the preferred alternative, but rather summarizes the overall strategy for remediating the site. The remedial action objectives describe what the proposed site cleanup is expected to accomplish. After the Record of Decision, the remedial design will be finalized and documented in the Remedial Design Work Plan for the site groundwater operable unit.

Response C-3: Public participation associated with the Proposed Plan is required under CERCLA. The Proposed Plan, as well as all the supporting documents (i.e., RI/FS package), was made available for public review and comment.

Response C-4: On the basis of current knowledge of the nature and extent of groundwater contamination at the chemical plant, the following general in-situ response actions that could be implemented to help reduce exposure to the contaminants or to reduce or remove elevated contaminant concentrations were evaluated in the Feasibility Study (July 1997).

- Containment
  - Immobilization via precipitation or adsorption/absorption
  - Hydraulic containment
  - Barrier walls
- Treatment
  - Bioremediation
  - Electrokinetics
  - Reactive chemical wall
  - Phytoremediation
  - Natural process
  - Air stripping
  - Chemical oxidation

While the site at Fort Lewis, Washington may have TCE contamination similar to that at the Weldon Spring Chemical Plant, there are many differences between the sites that support why the active methods could be applied at Fort Lewis and not here. Innovative technologies being

(Response C-4 cont.)

tried at Fort Lewis include phytoremediation, enhanced biodegradation, and in-situ reductive manipulation. Each of these methods was evaluated for the Weldon Spring site during the Feasibility Study process.

The water table at the chemical plant is located approximately 25 to 35 feet below the ground surface and within the bedrock. At Fort Lewis, the depth to the groundwater ranges from 4 to 12 feet below the ground surface. The application of phytoremediation for removing TCE, nitroaromatic compounds, nitrate, and uranium is promising; however, the depth of the groundwater at the chemical plant precludes its use as a remedial alternative.

The uranium levels in both Burgermeister Spring and Lake 34, while greater than background, do not pose a risk to the recreational users of the area or the ecological system. Since there is no risk, use of Lake 34 for removal of the uranium from the water using phytoremediation can not justified. Levels of uranium in both the spring and the lake have decreased over time because of the cleanup of uranium contaminated soil at the chemical plant. Monitoring of the groundwater and springwater over time will verify that levels continue to decrease due to attenuation of the remaining contamination in groundwater.

At Fort Lewis, it has been concluded that some biodegradation of TCE is occurring since the chemistry of the aquifer at Fort Lewis is somewhat suited for biological activity to occur. At the chemical plant, no degradation of TCE is occurring through biological activity and the chemistry of the shallow aquifer is not suited for biological activity. Dissolved oxygen concentrations are high across the chemical plant site; therefore anaerobic conditions are not present. Also, organic carbon, necessary for biodegradation, is not abundant in the shallow aquifer at the chemical plant. Biodegradation of nitroaromatic compounds has been extensively studied; however, in situ treatment is not recommended because of the potential mobility of more toxic intermediate compounds.

The third innovative technology under evaluation at Fort Lewis is in situ reductive manipulation through the use of a permeable reactive barrier that would result in the transformation of TCE into ultimately more benign products. Materials are injected through wells into the aquifer in the path of the TCE plume. Injected into the aquifer sediments, the reagent reduces oxidized iron (Fe^{3+}), which is naturally present in the sediments at Fort Lewis, to Fe^{2+}. When TCE impacted groundwater flows through the barrier, the Fe^{2+} reduces the TCE to ethylenes and chloride salts. A successful barrier must intercept the contaminated groundwater and not let TCE escape around it and flow through the barrier must be slow enough for the reactive iron to reduce it. At the chemical plant, the discrete flow paths are difficult to pinpoint and flow rates are generally rapid once groundwater enters the discrete flow paths.

Cost containment was not a factor in selecting Alternative 3. This alternative is the most costly of the three presented. Active remedial actions were determined to be technically ineffective and therefore a cost could not be assigned. Cost for the recent pump-and-treat and ICO efforts exceeded $5 million dollars.

Response C-5: See response to Comment C-4.

One hundred years is generally considered acceptable to EPA for a MNA remedy, especially as compared to the timeframes for more active remedies. In the case of the chemical plant site, more active remedies would be so inefficient that they could not impact (shorten) the overall cleanup timeframes.

C-6 cont. figure, the 10.6 kg removed would have surpassed the 10% threshold based on the 85 kg original estimate of total uranium burden. The trench strategy would then have had to be scaled up for long term treatment. Instead, DOE recalculated the starting amount, making the result achieved less than the 10% trigger point for further remediation. This raises concerns the start level was adjusted specifically to obviate the need to employ trench technology for long term remediation of the groundwater.

- Further fuel for the speculation that the Interceptor Trench work was not meant to meet goal, is the way DOE rapidly dismantled the trench over strenuous objections by MDNR. The Weldon Spring Citizens Commission and EPA stood by and acquiesced in this disappointing maneuver which was not justified at all to the general public. It was just done prematurely and furtively with little or no public discussion, like the proverbial Biblical "thief in the night."
- U.S. DOE owes the public an explanation for this premature destruction of a potential public and state asset. The Interceptor trench tool might become useful again in the future if certain still undefined trigger conditions and contingency plans require further uranium remediation in the future (see [1]).

C-7 6. The TCE oxidation attempt was partly successful and TCE was neutralized, but was the pilot work optimally designed to achive maximum remediation of the TCE? Again, one can turn to the Fort Lewis paradigm. It becomes clear that TCE oxidation treatments would have to be employed for several decades rather than the foreshortened test period that was actually employed and then on PP page12 are summarily dismissed: **"(quote) Active treatement alternatives have been thoroughly investigated and discarded as ineffective. (endquote)".**

C-8 7. During several long term stewardship public workshops, representatives from MDNR exhorted DOE to employ new and emerging technologies at Weldon Spring site. Yet the pump and treat and TCE oxidation methods of old alone were employed. It is estimated that 80% of atomic weapons related Superfund sites have contaminated GW, and TCE and uranium are common COCs. Why, then, have the newer technologies being employed successfully at such sites as Fort Lewis in Washington not been explored at WSS?

C-9 8. I am puzzled why the uranium contamination of GW lying beneath Katy Trail is not addressed in this proposed plan? Is this the PP for all GW at *both* The WSS and former WSOW sites? This is not clear in the PP.

C-10 9. The usage of warning signs as Institutional Controls should be addressed explicitly. The public has an absolute Right To Know the specific GW contaminants. The argument there is no risk is fallacious, otherwise there would be no need for monitoring or ICs – *Res Ipsi Loquitor* – "the thing speaks for itself." There is no low dose radiation threshold–any dose poses some risk.

Response C-6: The comment refers to work performed at the Weldon Spring Quarry that is not part of the Chemical Plant Groundwater Operable Unit. In addition to this administrative distinction, the groundwater at the quarry is in an entirely different hydrogeologic setting that is not suitable for comparison with the setting at the chemical plant.

Response C-7: The pilot-phase ICO was performed to evaluate the effectiveness of the ICO process under actual field conditions and to assess the feasibility of implementing a full-scale system. The pilot-phase consisted of testing this process at two locations, representing the upper and lower limits of the hydraulic conditions in the bedrock aquifer within the area of higher TCE concentrations. The development of a full-scale design was not possible at the outset of the project because of uncertainties associated with the hydrogeology of the site that influence design elements, such as the actual spacing of the injection wells, the zone of influence of these wells, and the amount of oxidants to be injected to reduce the TCE level.

It was envisioned in the interim Record of Decision that two sets of wells and two injections would achieve the MCL of 5 µg/l in the area of TCE impact. These specifications were based on the current knowledge about the innovative nature of the ICO process at that time. Preliminary remedial designs based on the results of the pilot-phase work indicate that at least 40 wells and an unknown number of injections would be needed to remediate the entire area where TCE exceeded the MCL. The area of TCE impact was determined to be larger than originally established at the time of the interim Record of Decision.

Response C-8: See response to Comment C-4.

Response C-9: Groundwater contamination beneath the Katy Trail near the Weldon Spring Quarry was addressed under the Record of Decision for the Quarry Residuals Operable Unit, which was completed in 1998.

The U.S. Army Corps of Engineers is addressing groundwater contamination at the Weldon Spring Ordnance Works and Training Areas under a separate action. During the remedial investigation and feasibility study stages, both the Corps of Engineers and Department of Energy performed work jointly.

Response C-10: See response to comment G-3. The need for monitoring is to determine if the remedy remains protective. The need for institutional controls is to prevent any future residential use of the groundwater.

The concept of the health index already incorporates a substantial margin of safety that the commenter does not acknowledge. To explain the hazard index it is necessary to start with the hazard quotient. The hazard quotient equation is the following:

$$\text{HazardQuotient} = \frac{\text{Estimated Daily Intake}}{\text{Reference Dose}}$$

C-10 cont.

• I reject EPAs concept that an arbitrary Health Index of 1.0 should be a trigger point for addressing potential harm to human health. Why? Because the assumption that we begin at a baseline of 0.0 (zero) is untrue. We all carry complex bodily burdens of pesticides, harmful chemicals and the cumulative radiation burden of the too-often cited **300 mrem annual "natural background" exposure**, plus other amounts accrued through numerous diagnostic mammograms, GI studies, chest x-rays, etc. In short, I believe both DOE and EPA often grossly underestimate human risk, relying too much on the calculations of Health Physicists who are just that, experts on radiation doses, but not necessarily even radiobiologists who have carried out radiation experiments in animal models. Only physicians in our society are legally qualified to make medical diagnoses of human illnesses, to prescribe medical treatments for humans, and have the real world training to fully understand the potential harm due to chemical and radiation-induced diseases through hands-on experience with people under their care.
• Where are the licensed MDs in this process? ATSDR rendered health assessments in 1995 and 1997, but this was years before DOE admitted recycled uranium had been used at Mallinckrodt-AEC sites, or when TCE contamination of GW was first noted at Weldon Spring Site. The two ATSDR health assessment reports of 1995 and 1997 did not cover these substances at all. RU implies the presence of transuranics such as plutonium and technetium, traces of which have been demonstrated at Weldon Spring Site.

C-11 10. The paragraph on page 7 of the PP beginning "The Missouri Department of Health..." is referenced on page 18 (Basko) as an e-mail communication with B. Cato at WSSRAP dated May 22, 2003. **I obtained a copy of this e-mail communication under the Missouri Sunshine statute.** I was surprised to learn that EPA had suggested that this language be inserted in the PP, and that DOE had written this exact language before DHSS had transmitted the relevant data files to them. I further discussed this issue with Mr. Gale Carlson of DHSS who supervises Ms. Basko. My concerns about the validity of this statement remain until I am allowed to examine all well test data on which the claim is based.

C-12 11. The PP does not explicitly document the nature and threats to human health and the environment of uranium, TCE, nitrates and nitoraromatics, the principal GW COCs. This deficit in the report needs to be addressed. Physicians with MD degrees, in addition to Health Physicist Ph.D.'s, should be involved in writing and peer-review editing of this section of the PP. ATSDR and Missouri DHSS might be called upon in this regard. DOE should fund further monitoring of adverse health effects to the fish in Busch Conservation area lakes 34-36 and in the Femme Osage slough since both are used by the public for fishing, and the fish are consumed as food.

— end of oral remarks —

(Response C-10 cont.)

In other words, the hazard quotient is the estimated daily intake (or exposure) for a reasonably maximally exposed individual divided by a reference intake level (or "reference dose") that would cause no adverse effects. Reference doses are chemical-specific values developed by the U.S. EPA that incorporate uncertainty factors of from 10 to 1000 to protect for different considerations such as individuals with greater-than-average sensitivity to the toxic effects of a given chemical. In addition to the large margins of safety incorporated into the reference dose values, the standard risk assessment process used to estimate the hazard quotients for the Weldon Spring site also intentionally somewhat overestimated the daily intakes of the chemicals of concern. This also adds a margin of safety to the hazard quotients.

The health index for several chemicals that exert toxicity to the same organ system is defined as the sum of the individual hazard quotients for each chemical. A hazard index value of less than 1 generally indicates that the reasonably maximally exposed person is unlikely to develop adverse health effects from exposure to the chemicals included in the evaluation.

The commenter did make some valid points about the possibility of other background exposures already adversely affecting the health of exposed individuals. However, to the extent possible, these considerations are taken into account in the hazard index calculations. For example, some contaminants (e.g., metals) are present in uncontaminated soils at low levels. The background concentrations of these metals in soils are included in the estimated daily intake from soils, so that those exposures are included in the estimated hazard index. Also, the EPA reference doses account for increased susceptibility to toxicity of sensitive members of the general population, which would include those whose health is somewhat impaired. However, in the final analysis, some highly sensitive members of the general public (called "hypersensitive" individuals) might not be protected from adverse toxic effects if exposed at the estimated level. As stated earlier, the technique of overestimating the likely exposure levels is used as a further conservative measure, adding protection for hypersensitive individuals.

The issue of recycled uranium has been previously addressed in comments and responses on the Long Term Surveillance and Maintenance Plan.

Response C-11: The discussion presented in the Draft Proposed Plan was based on data collected by the DHSS through 2001. The remainder of the data (2002 data) was requested from DHSS for inclusion in the final version of the Proposed Plan. The 2002 data simply provided additional documentation that the groundwater quality in the wells sampled showed no impact from the site.

Response C-12: The toxicity associated with each of the COCs identified for groundwater at the Chemical Plant is discussed in the Baseline Risk Assessment Report (issued in 1997) that have been prepared to support the Proposed Plan. This report along with other relevant supporting documentation can be found in the Administrative Record for the Groundwater Operable Unit (GWOU). The selected remedy presented in the final record of decision (ROD) for the GWOU includes additional fish sampling.

Comments on the
"Proposed Plan for Remedial Action
for the
Groundwater Operable Unit
at the
Chemical Plant Area
of the Weldon Spring Site,
Weldon Spring, Missouri"
dated August 2003

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Public Meeting August 13, 2003
Weldon Spring Interpretive Center

by

DANIEL W. MCKEEL, JR., M.D.

(Amended and extended oral remarks
based on the discussion at the 8/13 meeting)

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ORAL COMMENTS
Daniel W. McKeel, Jr., M.D.
August 13, 2003

D-1

1. Like the original August 9, 2003 LTSM document, this PP is too brief and lacks many essential details. It, too, appears to be very premature and incomplete. In particular, the sections on pages 14-15 dealing with triggers and contingency plans where DOE and MDNR differ totally lack specifics. Examples: (a), page 15, "Within the plumes, the trigger concentrations will be representative of historical highs"; (b) At the springs, the trigger concentrations will consider health-based values and historical trends." This type of wording is so vague that no regulatory or sicientifc meaning flows from it -- what are "health-based values", for instance? How will historical highs actually be used to set triggers?

2. There has been no opportunity thus far for general public comments on the process whereby remediation alternatives have been selected (see 3).

3. The **three chosen Alternatives do not encompass all reasonable, tested scientific options.** I favor a Fourth Alternative, active treatment based on latest technology, using the GW remediation at the Fort Lewis, Washington Superfund Site as a model to achieve unrestricted use in 40 years versus the preferred Alternative 3 that will take 100 years to comply with ARARS.
   - **I have the perception that cost and time were given undue consideration over protecting the public health and the environment.** These are goals that DOE, EPA and MDNR all endorse on paper but do not fully support as judged by the weak groundwater remediation efforts over the past several years since the public demanded remediation be attempted. Judged on performance achieved, a low performance score is merited based on the pilot study results.

4. I offer as proof of statement [2] the selected groundwater remedy chosen at the Fort Lewis, WA Superfund site where uranium and TCE are also major COCs. There, multiple innovative GW treatment options are being employed to reduce the original estimate to return the site to unrestricted use from 60 to 40 years. Alternative 3 offered in the PP for Weldon Spring will take 100 years to satisfy all ARARS, an *unacceptably long period of time.*

   ==========
   NOTE: I was cut off from speaking at this point by the facilitator
   ==========

5. **The Interceptor Trench design** was poorly engineered from the outset so that only only one of three sump pumps removed significant uranium-bearing groundwater. The excuse offered that the two year test period was especially dry (low rainfall) is not valid. Weather conditions in this area could have been forecast more accurately and a design made that allowed all 3 pumps to

Response D-1: See responses to comments C-1 through C-12.

D-I cont.

operate effectively. This was not done, and EPA, DOE and MDNR in concurring on the design and its implementation are at fault for not giving this proven and establsihed remediation technology a better try.

• In addition, the initial amount of total uranium burden was recalculated from 85 to over 1,400 kg near the end of the two year trial period. Using the original figure, the 10.6 kg removed would have surpassed the 10% threshold based on the 85 kg original estimate of total uranium burden. The trench strategy would then have had to be scaled up for long term treatment. Instead, DOE recalculated the starting amount, making the result achieved less than the 10% trigger point for further remediation. This raises concerns the start level was adjusted specifically to obviate the need to employ trench technology for long term remediation of the groundwater.

• Further fuel for the speculation that the Interceptor Trench work was not meant to meet goal, is the way DOE rapidly dismantled the trench over strenuous objections by MDNR. The Weldon Spring Citizens Commission and EPA stood by and acquiesced in this disappointing maneuver which was not justified at all to the general public. It was just done prematurely and furtively with little or no public discussion, like the proverbial Biblical "thief in the night."

• U.S. DOE owes the public an explanation for this premature destruction of a potential public and state asset. The Interceptor trench tool might become useful again in the future if certain still undefined trigger conditions and contingency plans require further uranium remediation in the future (see [1]).

6. The TCE oxidation attempt was partly successful and TCE was neutralized, but was the pilot work optimally designed to achive maximum remediation of the TCE? Again, one can turn to the Fort Lewis paradigm. It becomes clear that TCE oxidation treatments would have to be employed for several decades rather than the foreshortened test period that was actually employed and then on PP page12 are summarily dismissed: **"(quote) Active treatement alternatives have been thoroughly investigated and discarded as ineffective. (endquote)"**.

7. During several long term stewardship public workshops, representatives from MDNR exhorted DOE to employ new and emerging technologies at Weldon Spring site. Yet the pump and treat and TCE oxidation methods of old alone were employed. It is estimated that 80% of atomic weapons related Superfund sites have contaminated GW, and TCE and uranium are common COCs. Why, then, have the newer technologies being employed successfully at such sites as Fort Lewis in Washington not been explored at WSS?

8. I am puzzled why the uranium contamination of GW lying beneath Katy Trail is not addressed in this proposed plan? Is this the PP for all GW at *both* The WSS and former WSOW sites? This is not clear in the PP.

D-1 cont.

9. The usage of warning signs as Institutional Controls should be addressed explicitly. The public has an absolute Right To Know the specific GW contaminants. The argument there is no risk is fallacious, otherwise there would be no need for monitoring or ICs -- *Res Ipsi Loquitor* -- "the thing speaks for itself." There is no low dose radiation threshold--any dose poses some risk.
   - I reject EPAs concept that an arbitrary Health Index of 1.0 should be a trigger point for addressing potential harm to human health. Why? Because the assumption that we begin at a baseline of 0.0 (zero) is untrue. We all carry complex bodily burdens of pesticides, harmful chemicals and the cumulative radiation burden of the too-often cited **300 mrem annual "natural background" exposure**, plus other amounts accrued through numerous diagnostic mammograms, GI studies, chest x-rays, etc. In short, I believe both DOE and EPA often grossly underestimate human risk, relying too much on the calculations of Health Physicists who are just that, experts on radiation doses, but not necessarily even radiobiologists who have carried out radiation experiments in animal models. Only physicians in our society are legally qualified to make medical diagnoses of human illnesses, to prescribe medical treatments for humans, and have the real world training to fully understand the potential harm due to chemical and radiation-induced diseases through hands-on experience with people under their care.
   - Where are the licensed MDs in this process? ATSDR rendered health assessments in 1995 and 1997, but this was years before DOE admitted recycled uranium had been used at Mallinckrodt-AEC sites, or when TCE contamination of GW was first noted at Weldon Spring Site. The two ATSDR health assessment reports of 1995 and 1997 did not cover these substances at all. RU implies the presence of transuranics such as plutonium and technetium, traces of which have been demonstrated at Weldon Spring Site.

10. The paragraph on page 7 of the PP beginning "The Missouri Department of Health..." is referenced on page 18 (Basko) as an e-mail communication with B. Cato at WSSRAP dated May 22, 2003. **I obtained a copy of this e-mail communication under the Missouri Sunshine statute**. I was surprised to learn that EPA had suggested that this language be inserted in the PP, and that DOE had written this exact language before DHSS had transmitted the relevant data files to them. I further discussed this issue with Mr. Gale Carlson of DHSS who supervises Ms. Basko. My concerns about the validity of this statement remain until I am allowed to examine all well test data on which the claim is based.

11. The PP does not explicitly document the nature and threats to human health and the environment of uranium, TCE, nitrates and nitoraromatics, the principal GW COCs. This deficit in the report needs to be addressed. Physicians with MD degrees, in addition to Health Physicist Ph.D.'s, should be involved in writing and peer-review editing of this section of the PP. ATSDR and Missouri

D-1 cont. DHSS might be called upon in this regard. DOE should fund further monitoring of adverse health effects to the fish in Busch Conservation area lakes 34-36 and in the Femme Osage slough since both are used by the public for fishing, and the fish are consumed as food. However, human health monitoring is far higher on my personal priority list.

— end of 8/13/03 oral remarks —

Additional Remarks About The Proposed Plan Submitted In Writing Only

General comments on the commenting process

D-2 The 8/13/2003 public comment meeting did not meet the spirit of CERCLA in several key ways: (a) time for public comment was insufficient (3-4 minutes allocated per commentor), (b) agencies were allocated too much time, the meeting was ostensibly to solicit public comments, (c) no one needed to be cut-off in the midst of their remarks as was I, (d) the general public was not allowed to participate in the selection of alternatives, thus an active one was not presented to them to comment upon, (e) the use of a reponse summary, as is proposed for this Proposed Plan and Support Evaluation, instead of verbatim reporting of comments and answers (such as was done for the WSS long-term stewardship Aug 9, 2002 draft, for example), is unacceptable and will result of deletion from public scrutiny of many important comments that should be presented in full.

D-3 p. 2 mentions "two former dumps". One is the Quarry, what is the other one?

D-4 p. 2 Figure 2, Lake 36 should be labeled.

D-5 p. 3 TCE is 1 microgram/L in spring 6303. If this is true, explain how it could be that TCE has never appeared in Burgermeister spring 6301.

D-6 p. 3 Nitrates "exceed the MCL" ... "at locations on the MDOC property". What are the other locations besides Burgermeister spring 6301 and SED?

D-7 p. 4 Add a discussion of the chemical and radiologic adverse effects on human health and the environment of GWOU COCs.

D-8 p. 5 Isn't paragraph 1 a description of "karst" (porous) topography? We disagree that 5 ft = "small" with respect to water carrying COC's—I feel this is very large. Karst fractures are both horizontal and vertical.

D-9 p. 5 Column 2, middle of page, 3 aquifers communicate, provide documentation of extent.

Response D-2: Public participation associated with the Proposed Plan is required under CERCLA. The Proposed Plan, as well as all the supporting documents, was made available for public review and comment in both a public forum and by written submission. Preparation of a "Responsiveness Summary" that responds to pertinent public comments, criticisms, and new relevant information submitted during the public comment period is required. The "Responsiveness Summary" is a part of the Record of Decision.

Response D-3: The two "dumps" mentioned in the text are the "north dump" and the "south dump" located in the former Ash Pond Area. The Quarry is not included in this operable unit. It was addressed under two separate operable units – Quarry Bulk Waste Operable Unit and the Quarry Residuals Operable Unit.

Response D-4: Commented noted. We will identify Lake 36 in future use of this particular figure.

Response D-5: The water quality in SP-6301 and SP-6303 have always shown differences in contaminant profile due to the contributions from differing portions of both the chemical plant and the neighboring training area.

Response D-6: The locations being referred to in this paragraph are the groundwater monitoring wells located along the northern boundary of the chemical plant, but south of State Route D. Nitrate concentrations in the springs in the Southeast Drainage do not exceed the MCL.

Response D-7: These discussions were presented in the Baseline Risk Assessment Report that supports the PP.

Response D-8: The zones of core loss, which can be up to 5 feet in length, are generally clay filled, therefore limited groundwater movement occurs in these zones. Yes, fractures that depict karst characteristics can be either vertical or horizontal; however, at the chemical plant the ratio of horizontal fractures to vertical fractures is 20 to 1. The occurrence of fractures, both horizontal and vertical, also decreases with depth.

Response D-9: A full discussion regarding the communication between the three regional bedrock aquifers is provided in the Remedial Investigation for the Groundwater Operable Unit. See also response to D-17.

D-10 p. 6 Busch Lake numbers should be added to Figure 3.

D-11 p. 6 Figure 3. How could TCE be in spring 6303 but not in 6301 a short distance away? What is DOE's explanation? Were both 6303 and 6301 simultaneously sampled for TCE at the time TCE was detected in 6303?

D-12 p. 6 Bottom of page says "no groundwater contamination attributable to the Chemical Plant is present south of the divide." Question: where does the SED COC contamination come from if that is the case?

D-13 **APPENDIX A** - The COC contours are in 2-dimensions only; they should be rendered in 3 dimensions as was done for the Fort Lewis, WA uranium plume.
• **Comment and Question**: I asked for, and was promised 3-D plume maps for uranium in particular by MDNR and St. Charles county but these were never delivered and still apparently are unavailable. Does this indicate DOE and the other agencies lack sufficient vertical dimension plume test data to make the 3-D plots? Or is there some other explanation? If it exists, it should be added to all contour COC maps.

I ascribe to all of the comments and suggested Proposed Plan revisions suggested by MDNR in their May 13, 2003 detailed comments.

Respectfully submitted (via e-mail and Fax plus mailed hard copies),

Daniel W. McKeel, Jr., M.D.

Daniel W. McKeel, Jr., M.D. 9/03/2003

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Response D-10: Comment noted. The suggestion will be incorporated into future documents.

Response D-11: See response to Comment D-5. Sampling events for the two springs are typically within a close timeframe of each other.

Response D-12: Historically, contaminated groundwater originating from the Raffinate Pit 1 and 2 area migrated toward the Southeast Drainage and discharged at the springs. The impacted springwater in this drainage is the result of desorption and dissolution of residual contamination in the fractures of the losing portions of the drainage. The majority of the contamination in this drainage was sourced by overflow from the raffinate pits into the process sewer system, which discharged into the Southeast Drainage. Concentrations of the COCs in monitoring well MW-4026, located at the bottom of the drainage, indicate that groundwater is not presently impacted.

Response D-13: The text discusses that groundwater contamination is present primarily in the weathered portion of the Burlington-Keokuk Limestone. The depth of the weathered unit ranges from 30 ft to 65 ft below the ground surface in the area of groundwater impact. The depth to the top of the weathered unit ranges from approximately 50 to 75 ft below the groundwater surface. A three-dimensional depiction is not necessary to understand the extent of groundwater impact at the site.

Part II. Comments on the "Supporting Evaluation for the Proposed Plan for Final Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site, Weldon Spring, Missouri (August 2003)", DOE/GJ79491-934 by Daniel W. McKeel, Jr., M.D. (submitted 9/03/2003)

D-14 **pp 1-4.** Several active groundwater remediation technologies that have been used successfully elsewhere to remediate groundwater with uranium, nitrates, TCE and nitroaromatics (bioremediation, phytoremediation, for example) are not mentioned. The exploration of active remediation alternatives at WSS was neither comprehensive nor sufficiently intensive. More could be done and should be done and active remediation strategies should not be "dismissed" in this section, in the Proposed Plan, or in the Final GWOU Record of Decision (ROD) yet to be issued.

pp 5-22, Section 2. Site Background

D-15 pp. 7-12 COC "contour" maps depicted in Figures 2.2 - 2.7. The figures should be accompanied by 3-D plume maps for each of the same COC's to show the vertical as well as horizontal dispersion of each COC plume. I support the recommendations of both MDNR and MDOC made at the 8/13/03 public meeting in this regard. Further, there should be some indication how many data points are represented, and how such data were obtained, to define the vertical extent of each plume.

D-16 p. 14, section 2.1.2. Additional text needs to be added to indicate the water flow apparatus at spring 6301 (Burgermeister) is or is not currently operative to indicate high and low flow conditions (or that it will be repaired and when this will be done). I was told by Steve Lang of MDNR on March 14, 2003 while inspecting the SED and spring 5304 that this instrumentation was out of service and in need of repair.

D-17 p. 15, section 2.2.1. The second paragraph about the relationship between the three regional aquifers should be amended to indicate the vertical extent of communication between the three for groundwater and COCs. Existing data showing the amount of flow (in percentages, for example, for uranium), or concentration gradients, that exist between the superficial, intermediate and deep aquifers should be indicated and how this data was obtained. The number of data points should be stated. The phrase "Groundwater movement is controlled primarily by horizontal ..." should be clarified more exactly as to the vertical movement of GW. Pages of paper may be 2-D, but the real world, including contaminant plumes, is 3-D! This fact has been ignored way too long in graphic representations of groundwater aquifers at Weldon Spring Site for both the Chemical Plant and Quarry sites.

D-18 p. 16, Figure 2.8. This is a map of springs and drainage areas in the Chemical Plant area. The two creeks and springs on either side of SED should be named and numbered for accurate identification purposes. The **black dot north of U.S. route 40/61, Spring 6306**, was monitored routinely by DOE up until 1995 and has been since 2000 by both DOE and MDNR at the request of O'Fallon citizens. In the LTSM

Response D-14: See Response to Comment C-4.

Response D-15: A three-dimensional depiction is not necessary to understand the extent of groundwater impact at the site. The vertical and horizontal extent of contamination for the groundwater COCs at the chemical plant site was fully examined in the remedial investigation. Impact above background has been identified in the upper part of the unweathered unit. The significant amount of contamination is limited to the upper, weathered portion of the Burlington-Keokuk Limestone. Also, see response to Comment D-13.

Response D-16: Exact determination of the flow rate using the weir is not necessary to establish if baseflow or high flow conditions exist. The sensitivity of Burgermeister Spring is related to high flow (primarily precipitation induced) and baseflow conditions, not on minor changes in flow rate (i.e., gallons per minute). Repair of the weir by DOE for this program is not warranted.

Response D-17: A full discussion regarding the relationship between the three regional bedrock aquifers is presented in the Remedial Investigation for the Groundwater Operable Unit.

The principal aquifer systems identified in the Weldon Spring area are the alluvial aquifer and the three bedrock aquifers: shallow, middle, and deep. The three regional bedrock aquifers are separated by thick sequences of bedrock that form confining units. The shallow aquifer is composed of saturated overburden, the Burlington-Keokuk Limestone, and the Fern Glen Formation. The shallow bedrock aquifer is separated from the middle bedrock aquifer (Kimmswick Limestone) by 70 to 135 ft of fine-grained limestone, shaley sandstone, and shale, which forms a leaky confining unit over the middle bedrock aquifer. Beneath the middle aquifer are 210 to 295 ft of shales and fine-grained limestone that forms a confining unit over the deep aquifer (St. Peter Sandstone to Potosi dolomite). At the chemical plant, which is located near the groundwater divide, water levels indicate downward gradients and therefore recharge through the bedrock units. Near Burgermeister Spring, the major discharge point for groundwater from the chemical plant, water levels indicate that the shallow and middle bedrock aquifers discharge to Dardenne Creek in this area. The water levels in the deep bedrock aquifer is significantly lower that that of the shallow and middle aquifer and indicates a limited hydrogeologic connection between the deep and upper aquifers. The alluvial aquifer adjacent to the quarry is recharged by the Missouri River and discharge from the Plattin Limestone.

To address the concern about the potential for contaminated water to enter the deep aquifer from directly beneath the chemical plant area, the USGS completed a modeling study to quantitatively assess the groundwater flow system in St. Charles County. A regional three-dimensional groundwater flow model was developed to describe groundwater flow between the shallow, middle, and deep aquifers in the county. The study encompassed 280 square miles, which included most of St. Charles County. The results of the steady state model simulation indicate that 21% of the groundwater flow out of the shallow aquifer beneath the chemical plant area has the potential to enter the middle aquifer. Approximately 80% of the groundwater flow out the

(Response D-17 cont.)

middle aquifer in the same area have the potential to infiltrate into the deep aquifer. The quantity of water infiltrating from the shallow aquifer to the deep aquifer is small, and the time required for water to travel this distance is measured in hundreds of years.

Additionally, a water balance analysis of the Burgermeister Spring drainage was performed to evaluate the interaction of the surface water and groundwater systems. A USGS study indicated that about 25% of the total precipitation falling in the Burgermeister Spring drainage leaves as surface water runoff. Using data from this water balance study, information about the groundwater system can be made. On the basis of the three-dimensional groundwater model developed by USGS, 75% of the inflow to the shallow aquifer in the immediate vicinity of the chemical plant area is derived from precipitation. The average total recharge to the shallow aquifer (vertical infiltration and lateral inflow) is about 3.3 in/yr. using the USGS estimate of 2.5 in./yr. for maximum net recharge to the shallow aquifer from precipitation. The vertical recharge to the middle aquifer is 0.7 in./yr. The average total recharge to the middle aquifer (vertical infiltration and lateral inflow) is about 0.75 in./yr. The vertical recharge to the deep aquifer is about 0.6 in./yr.

This analysis likely overestimates the amount of deep infiltration derived from precipitation at the chemical plant area, because the losses from the shallow aquifer to the conduit that discharges at Burgermeister Spring. Comparison of the total flow from Burgermeister Spring to the recharge volume to the aquifer from infiltration of precipitation on the chemical plant and drainage area for Burgermeister spring indicates that the discharge volume accounts for 80% of the surface infiltration. If 80% of the infiltration were lost to Burgermeister Spring, the net recharge to the shallow aquifer would be 0.5 in./yr. If it were assumed that the remainder of the USGS model behaves as before, the amount of recharge to the deep aquifer would be 0.1 in./yr., which accounts for less than 1% of the total precipitation on the Burgermeister Spring drainage areas.

As part of the Remedial Investigation, subsurface dye tracing was conducted to determine whether a subsurface hydraulic connection could be detected between Burgermeister Spring and the chemical plant. Three springs in the Burgermeister Spring drainage were monitored for resurgence of injected dye. The data at the springs were collected at close time intervals, along with precipitation data, in an effort to gain further insight into the flow characteristics of the aquifer. Two of the injections showed positive results. Dye was initially detected within 2 to 7 days after injection. The study also indicated that increases in dye intensity coincided with precipitation events, as did the discharge rate at Burgermeister Spring. The results of this study also support the rapid horizontal transport of groundwater in the shallow aquifer once it enters the conduit features.

Response D-18: Although this map shows all the springs, creeks, and drainages in the Weldon Spring area, only those that are to be monitored for the GWOU have been labeled. No changes to this figure are necessary. Lakes 34, 35, and 36 will be labeled for future uses of this particular figure.

D-18 cont. interim draft, 6306 will be monitored for an unlimited time in the future because it is located in a heavily populated, growing residential area. The spring number should be added beside the black dot just as springs 6301 and 6303 in the same "6300" drainage are labeled. Also, **Lake 34** fed by 6303 and 6301 which in turn feeds 6306 should be labeled in the map. In fact, all of the streams, and Busch and Weldon Spring Conservation Area **Lakes 33, 35 and 36** (at least), should be labeled so that more exact locations of these important recipients of GW runoff can be identified by users of this report.

D-19 p. 17, section 2.2.1. The meaning of the last sentence in the first paragraph that "data from the groundwater downgradient of the springs indicate no impact" is unclear. Spring 5304 is barely visible on the SED creek bank and is only a few hundred yards from where SED crosses the Katy Trail. So where was the actual "groundwater downgradient" sampling point/s that were measured to support the validity of this statement? Does the sentence mean that contaminated GW flows from spring 5304 into SED and is then immediately diluted--please clarify which direction (towards the Missouri River?) is downgradient.

D-20 p. 17, section 2.2.2. The description of creeks and streams receiving Chemical Plant groundwater does not include any information about current concentrations of COCs except SED which is only one of many that are potentially or actually impacted). How recently have COC's been monitored in the various creeks and streams that are mentioned and shown on Fig. 2.8? This information is needed to more precisely define site baseline conditions prior to the GW ROD in 2003.

D-21 p. 17, section 2.2.3. A comment is that Weldon Spring Heights and Missouri Research Park had themselves removed from the National Priority List. WS Heights has a drinking water well (MO 6010919) that has been monitored for gross alpha and gross beta, but only once for uranium, a primary COC for WSS groundwater. Radium-226 and -228 have also been monitored in this well. This GW monitoring program should be mentioned along with the results and trending. I have several questions pending with the office of William Price of MDNR. I noted possible, irregular exceedances of MCLs in the WS Heights drinking water well test results he supplied to me. This type of analysis of the data should have been done long ago, and should not have to be initiated by a citizen stakeholder. It should not take so long to have straightforward questions answered about years-old data. The questions I asked of Mr. Price should have been answered as part of the regular ongoing MDNR monitoring efforts.

D-22 p. 18, section 2.2.3. The last sentence of this section mentions that "Two residencies are located on the MDC property north of the Chemical Plant." This is not very precise. Are the residencies located near Burgermeister Spring or it's runoff, for example? Has the groundwater been tested (applicable to next section 2.2.4 "Groundwater use") in the two residence wells for site COC's and what were the results?

Response D-19: See response to Comment D-12.

Response D-20: Dardenne Creek and Schote Creek are sampled on a semiannual frequency for uranium. Uranium values in these two creeks range between less than the detection limit (0.68 pCi/l) to 3 pCi/l. However, it should be noted that surface water drainages were impacted more by runoff from the Chemical Plant area than from groundwater discharges. Impacted groundwater discharging from Burgermeister Spring discharges into a drainage for Lake 34. Uranium values range from 2.7 pCi/l to 6.7 pCi/l in Lake 34.

Response D-21: The Weldon Spring Heights and the Missouri Research Park were not on the NPL.

The monitoring of the potable water supply at Weldon Spring Heights is part of the program performed by the Missouri Department of Health and Senior Services. The Department of Energy has no connection with this monitoring program. This well is not located along the groundwater flow path from the chemical plant site and groundwater is produced from the deep aquifer, which is not the aquifer of concern for this operable unit.

Response D-22: The two residences on the MDC property are located along State Highway D. Neither of these two residences obtains water from a well, as stated in the text in Section 2.2.4.

D-23 p. 18, section 2.2.4. **Groundwater Use.**

a) I believe the statement that the Missouri Research Park well is located "cross gradient of the site and therefore does not have the potential for impact" is probably an overstatement of the facts. Add an explanation supporting this concept. Prudence would dictate this well should be tested for site COC's as a baseline for the GW ROD, in light of the density of people in the MRP businesses now working at this large and growing industrial research park. Has the MRP well been so tested and what were the results? Summarize them in this section.

D-24 b) Figure 2.8 on page 16 shows two half solid and half dotted lines that contain perennial and wet weather springs and creeks that run parallel to SED. Are these two water systems impacted by Chemical Plant COCs in a similar way to the SED? They should be mentioned and discussed in terms of GW testing results. If they have a spring name or a spring number these data should be included in the Figure 2.8 map on p.16.

D-25 c) **A detail map of SED showing radioactive "hot spots" and exact spring locations** should also be added. The one I was pointed to by MDNR is insufficiently detailed to identify either the "hot spots" or the outfalls of spring 5304 within SED.

D-26 d) I have sent two letters to DHSS (Gale Carlson) requesting the complete off-site private well water test data related to the Weldon Spring Site. To date, I have received only the electronic data between 1998 and 2002 and have been promised, but not yet received, the earlier water well test data that is on paper forms. I believe it would be desirable to include in the Appendix letters from both MDNR and DHSS regarding the private well test data they have accumulated. I was told, for example, that DHSS/MDOH sends it's reports only to its clients, primarily MDNR, but also (presumably) to U.S. DOE for the Weldon Spring Site. These DHSS reports, which I have asked for from both DHSS and MDNR but not yet received, should be added to the list of references so stakeholders may know about and potentially be able to access them. These reports will also be important for future incorporation into the final long-term stewardship plan and the GW ROD.

D-27 e) Add the rationale for why DHSS during 2003 will be testing several wells within a 6 mile radius of the Chemical Plant? This is mentioned in the second sentence on page 19. Again, rather than citing an e-mail from DHSS about its private well testing program (Basko 2003), it would be far better to place this information in an Appendix directly as DHSS generated it. I have expressed concerns about including this Basko 2003 May 22, 2003 e-mail reference in one of my oral remarks that I was not allowed to present at the 8/13/03 public comment meeting. I was cut off after making only four of my 11 points. A typed version of my full oral remarks, with several "blue card" questions, were turned in to Wendy Drnec at the conclusion of the 8/13/03 meeting.

Response D-23: The well located in the Missouri Research Park is used for irrigation, as stated in the text. This well is not located along the groundwater flow path from the chemical plant site and groundwater is produced from the deep aquifer, which is not the aquifer of concern for this operable unit. The Department of Energy has not sampled this well.

Response D-24: Operations or groundwater from the chemical plant has not impacted the two drainages adjacent to the Southeast Drainage. This determination was presented in the Remedial Investigation for the Groundwater Operable Unit (1997).

Response D-25: The soil contamination in the Southeast Drainage addressed via the "Engineering Evaluation/Cost Analysis for the Proposed Removal Action at the Southeast Drainage near the Weldon Spring Site, Weldon Spring, Missouri" report issued in 1996. The impacted springs will be monitored under the Groundwater Operable Unit as discussed in the *Supporting Evaluation*.

Response D-26: The correspondence with the DHSS and the evaluation of their data by DOE will be in the Administrative Record for this operable unit. However, due to confidentiality issues, inquiries should be directed to the Missouri Department of Heath and Senior Services for data from their monitoring program.

Response D-27: The discussion on page 19 presents a summary of the program performed by the Missouri Department of Health and Senior Services. The Department of Energy has no involvement in this monitoring program. Data from this program can be requested from the Missouri Department of Health and Senior Services.

D-28 p. 19, section 2.2.5 Summary of Risk. The statement that "... both carcinogenic and noncarcinogenic effects were evaluated" needs to be clarified. Specifically, state what noncarcinogenic effects (e.g. known late effects of radiation including nephritis, pulmonary fibrosis, liver damage, cognitive impairment) were evaluated and how.

• I have appended a section, "Pumping wells 1991" data, based on DOE supplied well water test data, to emphasize two main points in commenting on section 2.2.5:

D-29 [1] The public drinking water wells PW02 through PW-09 in the St. Charles well field have experienced exceedances of EPA MCLs for drinking water as can be seen in my Tables 1 and 2. Specifically, the gross alpha MCL of 15 pCi/L was exceeded in PW-08 at **21.1** pCi/L on 12/16/96, in PW-05 at **19.2** pCi/L on 11/13/91, and in PW-03 at **38.0** pCi/L also on 11/13/91. All wells except PW-05 exceeded site background of 0.93 pCi/L uranium at their peaks and in many interval testings (column 6, Table 1). This is the real data (as opposed to citing the EPA MCL of 20 pCi/L for drinking water which is a trade-off between science and economics) that is relevant to human health and the environment. Clear exceedances in gross beta of the 15 pCi/L MCL (Table 2) occurred in PW-08 at **20.6** pCi/L on 12/20/2000, in PW-07 at **16.2** pCi/L on 12/17/1998, and at **130** and **56.3** (two samples) pCi/L obtained from PW-03 on 12/28/1995.

D-30 [2] These data indicate to me that Chemical Plant or Quarry COCs have impacted the well field. Several references I have included show that similar chronic exposures to uranium in drinking water lead to various types of kidney damage. This was found in AEC/Mallinckrodt uranium workers at the site (see Dupree-Ellis 2000, REF 4, part 1) and is supported by medical monitoring test results from residents living near the Fernald Ohio atomic weapons plant (REF8, part 1).

• My oral comments further emphasize why I believe the basic risk assumptions used are flawed. Primarily this is because the inaccurate simplifying assumptions are made that people's baseline EPA Health Index is 0, and that cancer is caused by only a single carcinogenic stimulus. In fact, in a mixed hazardous risk environment such as Weldon Spring Site, the "receptors" (people, animals and fish) have been chronically exposed for decades to multiple chemical and radioactive contaminants that may combine to act synergistically or additively. It is now well known that almost all of us have at least some pesticides, PCBs and uranium in our bodies. Thus all of our baseline risks are well above zero. Because no human testing has been done to residents living around the Weldon Spring Site to my knowledge, data on possible earlier impacts on human health, or elevated total body burdens of any of the identified COCs, are simply unavailable. This differs from the situation, for example, at Paducah KY and the Fernald, Ohio site, where extensive medical monitoring has been carried out.

• MDC and MDNR advocate more fish assays for COCs which I support. However, monitoring nearby residents and vicinity property users is much more important!

Response D-28: The discussion regarding the particular toxicities of the COCs evaluated for the risk assessment is presented in the Baseline Risk Assessment Report for the GWOU. A brief summary of this particular discussion has been included in the final ROD for the GWOU.

Response D-29: The comment is related to another Operable Unit (the Quarry Residuals Operable Unit in this case), which is not the subject of the Proposed Plan and this responsiveness summary. The DOE has prepared Administrative Records (ARs) for the other Operable Units that have already been completed for the site. These ARs contain relevant information about these Operable Units.

Response D-30: The comment is related to another Operable Unit (the Quarry Residuals Operable Unit in this case), which is not the subject of the Proposed Plan and this responsiveness summary. The DOE has prepared Administrative Records (ARs) for the other Operable Units that have already been completed for the site. These ARs contain relevant information about these Operable Units.

D-31 p. 21, section 2.2.6. No ARARS or MCLs adopted for gross alpha and gross beta have been included in this section. Yet these are the primary testing parameters used to detect possible radiologic cotamination of vicinity property springs, drainages and private and public (Weldon Spring Heights) and industry (Missouri Research park) wells. This omission should be remedied by stating gross alpha and beta MCLs.

D-32 **pp. 23-50, section 3. Reevaluation of Technologies and Identification of Final Alternatives.**

a) p. 29, section 3.1.2. My general comment is that active remediation efforts were not intensive enough, were too brief in the pilot phases to truly evaluate the technologies, or broad enough in scope, to justify the conclusion by DOE, MDNR and EPA that active remediation strategies for Weldon Spring groundwater are not feasible and would not lessen the 100 time frame to meet ARARS that Alternative 3 of the PP offers. See sentence ending "... would not reduce the remediation time frames for TCE, nitrates, uranium, or nitroaromatic compounds." I strongly disagree.

D-33 b) The complete written versions of my oral remarks at the 8/13/03 meeting describe in more detail my specific objections to the Interceptor Trench efforts to remove groundwater uranium near the Quarry site.

D-34 c) As I stated earlier, it remains unclear whether this GWOU PP addresses Quarry related GW, and if not, why not and where was that covered in a proposed plan? Presumably the final ~~GW ROD will cover contaminated GW related to the Chemical~~ Plant, Quarry and vicinity properties. I have heard the Army will issue a separate GW ROD. Somewhere in this PP, the relationships between the various PPs and RODs related to both the Army and DOE CERCLA sites (WSSRAP, WSOW) that comprise "the site" should be clarified including dates issued and targeted to be issued. For example, I believe the original timeline for issuing the final GW ROD was Spring 2003.

D-35 d) It should be noted that opposition several years ago by MDNR and citizen and other stakeholders to EPA about DOE leaving GW in place (which they felt was tantamount to walking away from the site with respect to GW remediation), as DOE proposed doing, led to the interceptor trench pilot and TCE neutralization by permanganate oxidation. These were not efforts initiated by U.S. DOE of its own volition.

D-36 e) This background makes me believe that **cost containment economics** is a major factor whereby Alternative 3 of the GWOU PP is preferred by DOE, MDNR and EPA. My question about this possibility was not answered at the 8/13/2003 meeting, even though this was promised as my oral presentation was cutoff. Why did this happen? I believe the answer is because the three agencies did not wish to be accountable for providing this information in a public forum with news media present. The question

Response D-31: The applicable or relevant and appropriate requirements (ARARs) and risk-based concentrations (RBCs) given in Section 2.2.6 were limited to those pertinent to the groundwater contaminants of concern (COCs) identified in Section 2.1.1. The only radioactive COC in groundwater is uranium, and the maximum contaminant level (MCL) of 30 µg/L (converted to 20 pCi/L for the isotopic ratios of uranium identified for the site) is included in Section 2.2.6. The gross alpha MCL of 15 pCi/L (in 40 CFR 141.15) and the gross beta monitoring limit of 50 pCi/L (in 40 CFR 141.26) were used as screening criteria to determine possible contamination in groundwater and springs in the vicinity of the site. These values have been used in the past as appropriate points of reference and this practice will continue in the future. However, it is not appropriate to include these values here (which are limited to chemical-specific ARARs), as gross alpha and gross beta have not been identified as specific COCs in groundwater at the site.

Response D-32: Comment noted.

Response D-33: The comment is related to another Operable Unit (the Quarry Residuals Operable Unit in this case), which is not the subject of the Proposed Plan and this responsiveness summary. The DOE has prepared Administrative Records (ARs) for the other Operable units that have already been completed for the site. These ARs contain relevant information about these Operable Units.

Response D-34: Groundwater contamination at the Weldon Spring Quarry was addressed under the Record of Decision for the Quarry Residuals Operable Unit, which was completed in 1998.

The U.S. Army Corps of Engineers is addressing groundwater contamination at the Weldon Spring Ordnance Works and Training Areas under a separate action. During the remedial investigation and feasibility study stages, both the Corps of Engineers and Department of Energy performed work jointly at the chemical plant site, the training area, and the Busch Conservation Area.

Response D-35: The Department of Energy recognizes that the additional groundwater field studies to evaluate groundwater extraction methods at the chemical plant site were performed at the insistence of the Missouri Department of Natural Resources and the public based on comments expressing concern that the initial proposal included active treatment for TCE only and not for all COC's. DOE decided to postpone the final groundwater decision until further field studies could be conducted to re-examine the effectiveness and practicality of active remediation of the other COC's. Consequently, an interim Record of Decision (IROD) was signed in September 2000 to address TCE contaminated groundwater using an in situ chemical oxidation process.

The quarry interceptor trench study was performed to support the decision to perform long-term monitoring of groundwater, as outlined in the Record of Decision for the Quarry Residuals Operable Unit, which was signed in 1998.

D-36 cont. still stands, and I expect a direct comprehensive answer to it soon. Certainly I expect an answer well before the final GW ROD is opened for public comment.

D-37 **pp 51-62, section 4. Analysis of Final Alternatives**

A general comment is that I strongly support MDNR's critique of 5/13/2003 regarding this PP and the "three final alternatives" mentioned on page 31. In doing so, I add and emphasize that the general public, including stakeholders such as myself, had no opportunity before the Proposed Plan and its Supporting Evaluation before August 2003. My comments submitted 9/3/03 and my 8/13/03 comments addressed at the sole public meeting are my input. It is obvious that MDNR had access to the PP/Supporting Evaluation reports well before even May 13, 2003 in order for them to prepare their detailed comments. The period for the general public to consider the PP/SE was thus too short and too late in the process of selection of alternatives. Had I been allowed to participate, I certainly would have argued strongly, as I do now, that a **fourth alternative, active remediation using all available technologies, be preferred over Alternative 3**. Not having active remediation as a fourth option to consider is not acceptable and this omission needs to be remedied in the final GWOU ROD.

D-38 p. 58, section 4.3.2.

a) The statement that "*Alternative 3 would provide adequate protection of human health and the environment*" is challenged [1] because Alternative 3 of the PP includes institutional controls that may include signage to educate and inform, as well as warn, the public. However, DOE, MDNR and MDOC, judged by their actions and words over many years, are totally opposed to posting any warning signs at the Katy Trail monitor well field south of the remediated Quarry, on the uranium-contaminated north bank of Femme Osage Slough, at the Quarry itself, along the Femme Osage Creek, at the Katy Trail crossing of the SED, within SED, or at spring 6301 (Burgermeister). This, in my view callous attitude on the part of all three agencies with respect to protecting the public has prevailed during the remediation period of 1987-2000 when ground and surface water uranium levels at these sites were much higher than present, still elevated levels. I strongly reject federal, state and county agency rationales that [1] the 6301 spring water is safe to drink; [2] there are no exposure pathways (there are: swimming, drinking); [3] the public "has a short attention span" and "would be scared unnecessarily." My input from the general public is that these are self-serving excuses, not facts. The public's Right to Know is overriding here and should no longer be ignored.

D-39 b) The statement that "*The natural attenuation processes of dilution and dispersion are expected to attenuate contaminant concentrations to levels that would allow use of the groundwater for unlimited use and unrestricted exposure (i.e., to ARARS)*" needs to be expanded upon, and clarified, to include trending evidence that shows an

Response D-36: See response to comment C-1. This response and all others will be made available to the public at the time the final ROD is signed and issued. No further public comment periods are associated with this decision.

Response D-37: Public participation associated with the *Proposed Plan* is required under CERCLA. The *Proposed Plan*, as well as all the supporting documents, was made available for public review and comment for 30 days. A public meeting was held at the site during the beginning of the public comment period, as required. CERCLA requires that the public be provided with a reasonable opportunity to submit written and oral comments on the *Proposed Plan*. Throughout the life of the project, DOE has been extremely open to sharing information and responding to comments. The decision-making process on chemical plant groundwater has included the issuance and availability of numerous documents and several public meetings. See also response to C-4.

Response D-38: The comment assumes that warning signs are necessary to make institutional controls effective. DOE disagrees. The comment also inaccurately summarizes DOE's position on warning signs. DOE has not ignored the public's right to know. The Interpretive Center is the most recent example of DOE's commitment to communication, but our track record also includes responses to individuals; grants to several local organizations; and the availability of documents and data at the site, at the local library, and on the internet. See response to Comment G-3.

Response D-39: Chapter 3 of the Supporting Evaluation provides an estimation of the projected timeframes for natural attenuation of each COC to levels less than the appropriate MCL. Trends in concentration of each COC in groundwater and the springs were presented in Section 2 of the Supporting Evaluation. Data from the springs cannot be used directly to determine the timeframes for concentrations to decrease to levels less than the MCL because these springs are or were impacted by not only a groundwater component, but also a surface water runoff component. This component cannot be modeled in the same fashion as the groundwater component. See also the responses to Comments B-1 and J-8.

The commentor has mistakenly assumed that the natural mechanisms present at the Weldon Spring Quarry are present at the Chemical Plant. Uranium is attenuated at the quarry through precipitation and adsorption. Geochemical conditions at the quarry result in the precipitation of dissolved uranium in groundwater that results in uranium levels indistinguishable from background in groundwater south of the slough. Adsorption of uranium onto the alluvial clays north of the slough also limits the extent of uranium in groundwater. The geochemical conditions present at the quarry are not present at the chemical plant. Sorption of uranium onto the aquifer materials does occur to some extent. Desorption of uranium was accounted for in the attenuation timeframe estimates.

D-39 cont. extrapolation to below ARAR levels in 100 years, the projected time frame for Alternative 3 of the PP. Data from springs 6301 and 5304 should be used for this analysis. The analysis should describe specifically how processes such as dispersion and dilution can lead to attenuation for uranium with its 4.47 billion year half-life. What would cause the uranium to disperse, if as claimed by DOE, the uranium is not now moving and is firmly absorbed to soil? How can dispersion be operative for uranium, for example, when the leading edge of the plume is stated to be fixed in place, not moving, because of the "natural" oxidation/reduction zone at the north bank of Femme Osage Slough? This reasoning defies scientific logic.

D-40 c) The statement "It is expected that the attenuation would occur **[within a reasonable time frame]**" should be modified replacing the bracketed text with "within 100 years", which is the actual time frame projected for Alternative 3 to achieve its goals. The phrase "Reasonable time frame" is too indefinite to have any useful meaning. What is reasonable to EPA, DOE and MDNR at WSS is obviously not reasonable to USGS who is remediating TCE at Fort Lewis Washington in a projected 40 year time frame using complementary active technologies, which seems more "reasonable" to me.

D-41 d) The final paragraph "MDNR has expressed support for this alternative because it provides for contingencies..." is somewhat misleading because a key objection is the nature of the contingencies and triggers, as expressed by Mimi Garstang of MDNR at the 8/13/03 public meeting. A letter from MDNR expressing their support for Alternative 3 contingencies should be included as an Appendix document to indicate that, indeed, "... MDNR has expressed its support" as the present August 2003 GWOU PP draft maintains is the case. The MDNR qualifiers and concerns need to be stated.

D-42 **pp 63-92, section 5. Preliminary Design for the Preferred Alternative**

p. 63, section 5.1 Institutional Controls.

a) This section addresses as ICs land use "insruments or mechanisms" but nothing about signage—not a word. I assert again this flagrantly, irresponsibly and wantonly negates and ignores **THE PUBLIC RIGHT TO KNOW**. I offer as evidence that the public is not the only stakeholder who believes this major oversight needs to be addressed. MDNR in at least three of their quarterly WSSRAP environmental oversight reports to DOE (which funds their activities on site) has included a photograph of the SED crossing the Katy Trail. The caption and accompanying text point to the need for signage at this location. Yet everyone involved, including MDNR, MDOC and DOE have ignored this agency request. I believe that refusal to use educatoinal, warning signage about the presence of specific elevated COCs (by name) such as uranium, nitrates, and nitroaromatics is a self-serving one rather than being truly done to avoid "scaring" the public with "it's short attention span." The agencies well know that fewer people might bring their children or fish at the Conservation areas, or visit the cell or

Response D-40: The term "reasonable timeframe" derives from EPA guidance and is a measure for the selection of Monitored Natural Attenuation over Alternative 2. Also see response to Comment C-4.

Response D-41: MDNR's final position on this remedy will be provided to DOE and captured in the Declaration Statement of the Record of Decision. See also the response to comment H-1.

Response D-42: See response to comment G-3.

D-42 cont. Katy Trail, if the full truth were disclosed. Nevertheless, that is exactly what needs to happen.

D-43 b) A segment of the general public, including me, strongly objects to being characterized in this demeaning and inaccurate manner as prone to be scared by the facts and having a short attention span which are both patently untrue. ICs should include warning signs!

D-44 c) I offer the references and DOE test data in my section on "Pumping Wells 1991 data" as support for my belief as a licensed physician and human pathologist on the faculty of a leading U.S. medical school, that the public is at significant risk by using the Katy Trail, the SED, fishing in the Femme Osage Slough, having unfettered access for decades to Burgermeister spring 6301 in the heart of the August A. Busch Memorial Conservation Area and to the unnamed creeks and springs and Lakes shown (but not labeled in many cases) on page 16, in the Figure 2.8 map.

D-45 **pp 93-94. Section 6. References**

I voice my strong objections to reference 2 (Basko R., 2003) and the last one listed (Vogel J 2003) which are to e-mails that public stakeholders have no ready access to. The body of both 5/22/03 and 4/3/03 e-mails should be included as an Appendix to the PP/SE. I did obtain the 5/22/03 Basko to Cato e-mail under a Missouri Sunshine Law request (from Rose Basko of DHSS) and have commented on its contents in my written version of my 8/13/03 oral comments on the Proposed Plan. I will make a similar Sunshine/FOIA request to obtain the April 3, 2003 e-mail from John Vogel of MDOC and Pamela Thompson, project manager at WSSRAP. Also, the content of these e-mails should become part of the WSS administrative record and the EPA Superfund records at Kansas City as part of site documentation. Stakeholders have a right to see this information and should not have to do cartwheels to get it.

Respectfully Submitted (e-mail with Faxed and Mailed hard copies),

Daniel W. McKeel, Jr., M.D.

Daniel W. McKeel, Jr., M.D.

September 3 (Wednesday), 2003

Response D-43: See response to comment D-38.

Response D-44: Test data regarding the pumping wells in the County wellfield near the DOE Quarry is not relevant to a decision on the Groundwater Operable Unit at the Chemical Plant Area. The Quarry groundwater was addressed in the Quarry Residuals Operable Unit Record of Decision (Sep 1998).

Response D-45: The correspondence with MDC and the correspondence with the DHSS and the DOE's evaluation of their data will be included in the Administrative Record for this operable unit. However, due to confidentiality issues, inquiries should be directed to the Missouri Department of Health and Senior Services for data from their monitoring program.

"PUMPING WELLS 1991" DATA
St Charles County, Missouri, public drinking water well field
DOE data supplied to DWM 6/13/2001

D-46 **Table 1.** Highest concentration and ranges of gross alpha and uranium in the nine "PW" wells 1991-2001 (294 of 7744 total samples for gross alpha and 304 of 7744 total samples for total uranium)

Well Number	Highest Conc. Date[1]	Gross Alpha	Concentr. Range[1]	Highest Conc. Date	Total Uranium[2]	Concentr. Range[1]
PW-09	12/9/93	5.3	1.75 - 5.3	9/22/98	5.60	.18 - 5.60
PW-08	12/16/96	21.1	1.1 - 21.1	9/22/98	2.11	.125 - 2.11
PW-07	2/24/93	9.2	1.5 - 9.2	9/22/98	4.06	.129 - 4.06
PW-06	12/17/98	7.81	1.53 - 7.81	8/31/94	1.38	.144 - 1.38
PW-05	11/13/91	19.2	1.0 - 19.2	3/21/96	.738	.0706 - .738
PW-04	2/24/93	4.9	1.41 - 4.9	9/22/98	1.19	.042 - 1.19
PW-03	11/13/91	38.0	1.0 - 38.0	2/15/95	6.64	.047 - 6.64
PW-02	3/24/98	3.91	1.30 - 3.91	9/22/98	8.82	.0768 - 6.82
All 2-9	11/13/91	38.0	1.0 - 38.0	9/22/98	6.82	.047 - 6.82

[1] Note all concentrations are expressed as pCi/L
[2] Note the DOE Weldon Spring total uranium background is 0.93 pCi/L

Point: Mike Duvall, head of St. Charles county Environmental Services, stated in several open public meetings during 2001, 2002 that he would stake his professional career and say unequivocally that no elevations of radioactivity have ever been detected in the St. Charles county well field—the water is safe to drink.

Rebuttal: The data in Table 1 contradicts Mr. Duvall's repeated assertions, that have been echoed by U.S. DOE-WSSRAP personnel, in at least three ways:
• **First**, peak all-time uranium levels in all wells except PW05 exceed DOE's site background of 0.93 pCi/L for total uranium.
• **Second**, total uranium and gross alpha measurements, which DOE and Mr. Duvall (among other officials) state represent "background" levels, implying "natural" background levels, obviously fluctuate widely as shown in the concentration range columns 4 and 7 of Table 1 and Table 2 on page 2 of this document.
• **Third**, the peak levels of 21.1 pCi/L and 38.0 pCi/L in PW-08 and -03 in December 1996 and November 1991 are high by any standards and cannot be viewed as "natural" or "natural background". The data challenge that view and make it untenable.

Daniel W. McKeel, Jr., M.D.'s conclusions from the DOE data: Gross alpha and total uranium elevations above natural background have been exceeded on several dates spanning 1991 through 2001. The fact that total uranium levels peaked in four St. Charles public drinking water wells simultaneously on September 22, 1998 rather suggests that some discrete contaminating event occurred preceding, or on that date, to elevate both measures of radioactivity above baseline. Unless proof by DOE or St. Charles county can be produced that this event was natural and unrelated

page 2

Response D-46: The comment is related to another Operable Unit (the Quarry Residuals Operable Unit in this case), which is not the subject of the Proposed Plan and this responsiveness summary. The DOE has prepared Administrative Records (ARs) for the other Operable units that have already been completed for the site. These ARs contain relevant information about these Operable Units.

D-46 cont. to actiivties at the Weldon Spring Site Remedial Action Project (WSSRAP), either at the Chemical Plant or Quarry remediation sites, one must conclude the gross alpha and total uranium elevations were in fact related to WSSRAP activities, and thereby did further contaminate the public drinking water supply of St. Charles county.

D-47 **Table 2**. Highest concentration and ranges of gross alpha compared with gross beta in the nine "PW" wells 1991-2001 (295 of 7744 total samples for gross alpha and 263 of 7744 total samples for gross beta)

Well Number	Highest Conc. Date[1]	GROSS ALPHA	Concentr. Range	Highest Conc. Date	GROSS BETA	Concentr. Range
PW-09	12/9/1993	5.3	1.75 - 5.3	11/29/1994	10.3	3.40 - 10.3
PW-08	12/16/1996	21.1	1.1 - 21.1	12/20/2000	20.6	1.46 - 20.6
PW-07	2/24/1993	9.2	1.5 - 9.2	12/17/1998	16.2	4.06 - 16.2
PW-06	12/17/1998	7.81	1.53 - 7.81	9/28/1995	9.3	3.72 - 9.3
PW-05	11/13/1991	19.2	1.0 - 19.2	12/9/1993	10	2.95 - 10
PW-04	2/24/1993	4.9	1.41 - 4.9	12/16/1996	9.62	3.9 - 9.62
PW-03	11/13/1991	38.0	1.0 - 38.0	9/28/1995 9/28/1995	130 56.3	130 56.3
PW-02	3/24/1998	3.91	1.30 - 3.91	12/19/1996	10.2	4.13 - 10.2
All 2-9	11/13/1991	38.0	1.0 - 38.0	12/19/1996	130	1.46 - 130

[1] Note all concentrations are expressed as pCi/L

The same comments made about results in Table 1 also apply to those in Table 2. Here, however, unequivocal elevations of gross beta occurred on September 28, 1995. That this result was considered signifcant is the fact that two PW03 well samples were obtained that day instead of the usual single sample per well. One wonders how the sampler knew to take two samples that day, unless it was known that WSSRAP activities had impacted groundwarer to a greater degree than usual.
The gross beta levels again challenge the validity of Mr. Duvall's and DOE's repeated statements that DOE activities have never impacted the St. Charles county well field.

Note also that PW-03 has the highest gross alpha reading of all wells, suggesting that the topographic location of wells in the well field has a bearing on whether or not they experience higher radioactivity levels as a function of WSSRAP-related activities. Similarly, PW-08 has the second overall highest elevations of gross alpha and beta.

Mr. Duvall's statements that well field wells had never had "elevations" could be construed only in the very narrowest sense that EPA MCL's had not been exceeded. While this may be true for total uranium (MCL limit 30 pCi/L or 20 pCi/L when adjusted for WSS uranium isotope mix), gross alpha and beta MCLs of 15 pCi/Ls (or lower) have been clearly exceeded in several wells over a long time span, further refuting "no elevation ever" claims based on MCLs. Gross alpha and beta MCLs and relevant ARARS should be given in the GWOU Proposed Plan as stated elsewhere.

Page 3

I would argue that chronic elevations of uranium in drinking water at WSS has already exposed the St. Charles county residents to significant adverse health risks both from

Response D-47: The comment is related to another Operable Unit (the Quarry Residuals Operable Unit in this case), which is not the subject of the Proposed Plan and this responsiveness summary. The DOE has prepared Administrative Records (ARs) for the other Operable units that have already been completed for the site. These ARs contain relevant information about these Operable Units.

D-47 cont.

chemical toxicity (developing nephritis) and radioactivity (developing renal cell [kidney] cancer) as shown by the attached references.

This data analysis will be sent to DOE (Pam Thompson in 9/3/03 GW PP comments), St. Charles county (Joe Ortwerth, Mike Duvall), MDNR (Bob Geller, Mimi Garstang, Larry Erickson), EPA (Dan Wall) and WSCC (Helene Diller to be distributed to all commissioners).

Daniel W. McKeel, Jr., M.D.

Daniel W. McKeel, Jr., M.D. 9/03/2003

5587-C Waterman Blvd
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e-mail: dan@wubios.wustl.edu

Enclosure:
- References to uranium chemical and radioactivity toxicity

D-48 REFERENCES TO URANIUM TOXICITY

[1]
Kurttio P. Auvinen A. Salonen L. Saha H. Pekkanen J. Makelainen I. Vaisanen SB. Penttila IM. Komulainen H.
Institution
STUK-Radiation and Nuclear Safety Authority, Research and Environmental Surveillance, Helsinki, Finland. paivi.kurttio@stuk.fi
Title
Renal effects of **uranium** in drinking water.
Source
Environmental Health Perspectives. 110(4):337-42, 2002 Apr.
Local Messages
Title held by Becker Library.
Abstract
Animal studies and small studies in humans have shown that **uranium** is nephrotoxic. However, more information about its **renal** effects in humans following chronic exposure through drinking water is required. We measured **uranium** concentrations in drinking water and urine in 325 persons who had used drilled wells for drinking water. We measured urine and serum concentrations of calcium, phosphate, glucose, albumin, creatinine, and beta-2-microglobulin to evaluate possible **renal** effects. The median **uranium** concentration in drinking water was 28 microg/L (interquartile range 6-135, max. 1,920 microg/L) and in urine 13 ng/mmol creatinine (2-75), resulting in the median daily **uranium** intake of 39 microg (7-224). **Uranium** concentration in urine was statistically significantly associated with increased fractional excretion of calcium and phosphate. Increase of **uranium** in urine by 1 microg/mmol creatinine increased fractional excretion of calcium by 1.5% [95% confidence interval (CI), 0.6-2.3], phosphate by 13% (1.4-25), and glucose excretion by 0.7 micromol/min (-0.4-1.8). **Uranium** concentrations in drinking water and daily intake of **uranium** were statistically significantly associated with calcium fractional excretion, but not with phosphate or glucose excretion. **Uranium** exposure was not associated with creatinine clearance or urinary albumin, which reflect glomerular function. In conclusion, **uranium** exposure is weakly associated with altered proximal tubulus function without a clear threshold, which suggests that even low **uranium** concentrations in drinking water can cause nephrotoxic effects. Despite chronic intake of water with high **uranium** concentration, we observed no effect on glomerular function. The clinical and public health relevance of the findings are not easily established, but our results suggest that the safe concentration of **uranium** in drinking water may be within the range of the proposed guideline values of 2-30 microg/L.

Response D-48: EPA considers relevant uranium toxicity studies in the development of MCL.

D-48 cont.

[2]
Hakonson-Hayes AC. Fresquez PR. Whicker FW.
Institution
Environment, Safety, and Health Division, Los Alamos National Laboratory, NM 87545, USA.
Title
Assessing potential risks from exposure to natural **uranium** in well water.
Source
Journal of Environmental Radioactivity. 59(1):29-40, 2002.
Abstract
Over 50% of the wells in the Nambe region of northern New Mexico exceed the US Environmental Protection Agency's recommended drinking water standard of 20 microg l(-1) for 238U; the highest in the area was measured at 1,200 microg U l(-1). **Uranium** uptake was estimated in tomato (Lycopersicon esculentum), squash (Cucurbita pepo), lettuce (Lactuca scarriola), and radish (Raphanus sativus) irrigated with Nambe well water containing <1, 150, 500, and 1,200 microg U l(-1). Plant uptake and human dose and toxicity associated with ingestion of water and produce and inhalation of irrigated soil related to gardening activities were evaluated. **Uranium** concentration in plants increased linearly with increasing U concentration in irrigation water, particularly in lettuce and radish. The estimated total committed effective dose for 70 years of maximum continuous exposure, via the three pathways to well water containing 1,200 microg U l(-1), was 0.17 mSv with a corresponding **kidney** concentration of 0.8 microg U g(-1) **kidney**.

[3]
Sanchez DJ. Belles M. Albina ML. Sirvent JJ. Domingo JL.
Institution
Laboratory of Toxicology and Environmental Health, School of Medicine, Rovira I Virgili University, Reus, Spain.
Title
Nephrotoxicity of simultaneous exposure to mercury and **uranium** in comparison to individual effects of these metals in rats.
Source
Biological Trace Element Research. 84(1-3):139-54, 2001 Winter.
Local Messages
Title held by Becker Library; print canceled.
Abstract
Both inorganic mercury and **uranium** are known nephrotoxicants in mammals. In this study, the **renal** toxicity of a concurrent exposure to inorganic mercury and **uranium** was compared with the nephrotoxic effects of the individual metals in a rat model. Eight groups of rats, 10 animals per group, were subcutaneously given a single administration of mercuric chloride (HgCl2, 0.34 mg/kg and 0.68 mg/kg), uranyl acetate dihydrate (UAD, 2.5 mg/kg and 5 mg/kg), or combinations of both compounds at the same doses. A ninth group of rats received sc injections of 0.9% saline and

D-48 cont.

was designated as the control group. Necrosis of proximal tubules, which was observed in all experimental groups, was the most relevant morphologic abnormality. Marked changes, which were remarkably greater than those induced by the individual elements, were noted in some urinary parameters in the groups concurrently exposed to HgCl2 and UAD. It could be an indicator of a synergistic interaction between mercury and **uranium**. In contrast, compared with the urinary levels found after individual administration of the highest doses of mercury and **uranium**, significant reductions in the urinary concentrations of these elements were noted following simultaneous exposure to both metals. At these doses, the reduction in the urinary metal excretion was also accompanied by significant decreases in the **renal** content of mercury and **uranium**. Whereas the results of some parameters pointed out a possible synergistic interaction between mercury and **uranium**, other measures hinted that an antagonistic interaction between these elements is also present.

[4]
Dupree-Ellis E. Watkins J. Ingle JN. Phillips J.
Institution
Center for Epidemiologic Research, Oak Ridge Associated Universities, TN 37830-0117, USA.
Title
External radiation exposure and mortality in a cohort of **uranium** processing workers.
Source
American Journal of Epidemiology. 152(1):91-5, 2000 Jul 1.
Local Messages
Title held by Becker Library.
Abstract
In a study of 2,514 White male workers employed between 1942 and 1966 at a US **uranium** processing plant, mortality was compared with overall US mortality, and the relation between external ionizing radiation and cancer was evaluated. Through 1993, 1,013 deaths occurred. The mean cumulative dose was 47.8 mSv. The standardized mortality ratio (SMR) was 0.90 for all causes of death and 1.05 for all cancers. Many cancer sites had elevated SMRs. Among nonmalignant outcomes, the SMR for chronic nephritis was 1.88 (six deaths observed). An excess relative risk estimate of 10.5 per Sv (10 cases) was observed for **kidney** cancer; this may have resulted from chance, internal radiation, or chemical exposures not considered.

[5]
Ritz B.
Institution
Department of Epidemiology, School of Public Health, University of California, Los Angeles 90095-1772, USA.
Title
Cancer mortality among workers exposed to chemicals during **uranium** processing.
Source

D-48 cont.

Journal of Occupational & Environmental Medicine. 41(7):556-66, 1999 Jul.

Local Messages

Title held by Becker Library.

Abstract

Data provided by the Comprehensive Epidemiology Data Resource allowed us to study patterns of cancer mortality as experienced by 3814 **uranium**-processing workers employed at the Fernald Feed Materials Production Center in Fernald, Ohio. Using risk-set analyses for cohorts, we estimated the effects of exposure to trichloroethylene, cutting fluids, and kerosene on cancer mortality. Our results suggest that workers who were exposed to trichloroethylene experienced an increase in mortality from cancers of the liver. Cutting-fluid exposure was found to be strongly associated with laryngeal cancers and, furthermore, with brain, hemato- and lymphopoietic system, bladder, and **kidney** cancer mortality. Kerosene exposure increased the rate of death from several digestive-tract cancers (esophageal, stomach, pancreatic, colon, and rectal cancers) and from prostate cancer. Effect estimates for these cancers increased with duration and level of exposure and were stronger when exposure was lagged.

[6]

Zamora ML. Tracy BL. Zielinski JM. Meyerhof DP. Moss MA.

Institution

Radiation Protection Bureau, Department of Health, Ottawa, Ontario, Canada.

Title

Chronic ingestion of **uranium** in drinking water: a study of **kidney** bioeffects in humans.

Source

Toxicological Sciences. 43(1):68-77, 1998 May.

Abstract

A study was conducted of the chemical effects on the human **kidney** induced by the chronic ingestion of **uranium** in drinking water. Subjects were divided into two groups: The low-exposure group, whose drinking water was obtained from a municipal water system and contained < 1 microgram **uranium**/L, and the high-exposure group, whose drinking water was obtained from private drilled wells and contained **uranium** levels that varied from 2 to 781 micrograms/L. Years of residence varied from 1 to 33 years in the low-exposure group and from 3 to 59 years in the high-exposure group. The indicators of **kidney** function measured in this study included glucose, creatinine, protein, and beta 2-microglobulin (BMG). The markers for cell toxicity studied were alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT), lactate dehydrogenase (LDH), and N-acetyl-beta-D-glucosaminidase (NAG). Urinary glucose was found to be significantly different and positively correlated with **uranium** intake for males, females, and pooled data. Increases in ALP and BMG were also observed to be correlated with **uranium** intake for pooled data. In contrast, the indicators for glomerular injury, creatinine and protein, were not significantly different between the two groups nor was their urinary excretion correlated to **uranium** intake. These results

D-48 cont.

suggest that at the intakes observed in this study (0.004 microgram/kg to 9 micrograms/kg body wt), the chronic ingestion of **uranium** in drinking water affects **kidney** function and that the proximal tubule, rather than the glomerulus, is the site for this interference.

[7]
Taylor DM. Taylor SK.
Institution
University of Heidelberg, Institute of Pharmacology and Toxicology, Germany.
Title
Environmental **uranium** and human health. [Review] [69 refs]
Source
Reviews on Environmental Health. 12(3):147-57, 1997 Jul-Sep.
Abstract
Uranium from the environment enters the human body by ingestion with food and drink and by inhalation of respirable airborne **uranium**-containing dust particles or aerosols. Daily intake of **uranium** in food and water varies from approximately 1 to approximately 5 micrograms U/d daily in uncontaminated regions to 13-18 micrograms/d or more in **uranium** mining areas. A 70 kg, non-occupationally exposed 'Reference Man' living in Europe or in the United States has an estimated total body **uranium** content of about 22 micrograms. **Uranium** is absorbed from the intestine or the lungs, enters the bloodstream, and is rapidly deposited in the tissues, predominantly **kidney** and bone, or excreted in the urine. In the bloodstream, **uranium** is associated with red cells, and its clearance is relatively rapid. **Renal** toxicity is a major adverse effect of **uranium**, but the metal has toxic effects on the cardiovascular system, liver, muscle, and nervous system as well. Any possible direct risk of cancer or other chemical- or radiation-induced health detriments from **uranium** deposited in the human body is probably less than 0.005% in contrast to an expected indirect risk of 0.2% to 3% through inhaling the radioactive inert gas radon, which is produced by the decay of environmental **uranium**-238 in rocks and soil and is present in materials that are used to build dwellings and buildings where people live and work. [References: 69]

[8]
Authors
Pinney SM. Freyberg RW. Levine GE. Brannen DE. Mark LS. Nasuta JM. Tebbe CD. Buckholz JM. Wones R.
Institution
Department of Environmental Health, University of Cincinnati College of Medicine, Cincinnati, Ohio 45267-0056, USA. susan.pinney@uc.edu
Title
Health effects in community residents near a **uranium** plant at Fernald, Ohio, USA.
Source

Page 9

D-48 cont.

International Journal of Occupational Medicine & Environmental Health. 16(2):139-53, 2003.

Abstract

OBJECTIVES: Health outcomes in persons who lived in the area surrounding a U.S. Department of Energy (DOE) uranium processing plant near Fernald, Ohio were evaluated using data of Fernald Medical Monitoring Program (FMMP) participants. **METHODS:** Residential history information was used to identify participants who lived in close proximity to the plant (less than 2 miles), in the direction of groundwater runoff (south of the plant), or used a well or cistern as a drinking water source. Standardized prevalence ratios (SPRs) for certain disease endpoints were calculated using the U.S. National Health Interview Survey(NHIS) and the National Health and Nutrition Examination Survey (NHANES) data files for comparison rates. **RESULTS:** Findings suggest that prior living within the Fernald exposure domain is related to increased prevalence of urinary system disease. Statistically significant elevations of bladder disease (standardized prevalence ratio or SPR = 1.32) and kidney disease (SPR = 2.15), including sub-categories, kidney stones (SPR = 3.98) and chronic nephritis (SPR = 2.03) were noted, as well as increased rates for hematuria and urethral stricture. In regression analyses with adjustment forage and sex, serum creatinine levels were increased in those who had lived close to the plant. Increased white blood cell count and hemoglobin levels, and decreased mean corpuscular volume were also found in those living less than 2 miles from the plant. Those who used a well or cistern for drinking water were found to have increased urinary microalbumin, red blood cell count and hematocrit. **CONCLUSIONS:** These preliminary findings will provide the basis for future hypothesis testing incorporating important determinants of exposure not included in this study, such as duration and calendar year of exposure, location relevant to prevailing wind direction, and age at exposure.

U. S. Department of Energy
Weldon Spring Site
Attn: Wendy Drnec
7295 Hwy. 94 South
St. Charles, MO 63304

Comment on the Overall presentation of the Chemical Plant Groundwater Operable Unit Public Meeting of August 13, 2003.

After following the story of the Weldon Spring Site Remediation through independent research and video review of meetings and site visits, I am offering the following comment:

The proposed plan is an unconvincing and embarrassingly shallow and ultimately inaccurate and dangerous governmental report that amounts to an immediate waste of taxpayers money. Moreover, such an incomplete and biased "Proposed Plan for Final Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site . . . ," as reality keeps emerging, is likely to betray the trust and respect for local, state and federal government that several generations of Americans have worked very hard to establish. I am far more worried about both the actual and potential consequences of toxic contamination of the land, air, and water around the Weldon Spring Site than I was when I began to follow this remediation story in 1998. I do not think local children at Francis Howell High School or most citizens of St. Charles County are aware of the dangers and possible precautions needed to deal with individual exposure to the remaining toxic and radioactive "legacy" that lies within both their front and back yards.

Most people in St. Charles County are not "engaged" in the business of monitoring and adapting to all the toxic and radioactive contamination that does

currently and potentially affect their water sources, their land usefulness, their property values and their disaster preparedness, particularly that which has resulted from the historic activities at the entire Weldon Spring Site.

An important part of the reason most people could not spend much time and effort on such vital public concerns is that they are discouraged from finding, if not from seeking, the critical facts that everyone needs and deserves to know. Another reason is that most people, possibly by political design, work such long hours and/or have such irrelevant schooling that they could never find the time or maintain the intellectual strength it takes to make sense of the vague and omitted and otherwise deceiving plans and reports that are customarily presented to the taxpayers (including local and state officials, as well as the general public) by the progressively remote U. S. Department of Energy.

E-1 Generally, the current "Proposed Plan" is unacceptable because it fails to include an active remediation alternative.

Louise McKeel, Village Image News, St. Louis, Missouri, 63112
314-367-8888

Response E-1: Active remediation alternatives were investigated and two were field tested. None have been identified that would be effective in reducing the time frames that will be required for the groundwater contamination to naturally attenuate.

Weldon Spring Citizens Commission

7295 Highway 94 South
Saint Charles, Missouri 63304

September 2, 2003

Ms Pamela Thompson
U.S. Department of Energy,
Weldon Spring Site Remedial Action Project
7295 Highway 94 South
Saint Charles, Missouri 63304

Dear Pam:

F-1 The Weldon Spring Citizens Commission (WSCC) continues to support the Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources (MDNR) in the effort to produce the Proposed Plan (PP) for the Groundwater Operable Unit (GWOU) and the Supporting Evaluation. The Commission is aware that the documents represent many years of planning, study and evaluation. The cooperative efforts of the parties involved have resulted in the production of two viable documents for public evaluation.

At the Public Meeting on Wednesday, August 13, 2003, DOE presented the PP to the public in attendance. The many members of the public voiced a substantial number of comments. The Commission is not necessarily in agreement with all of the comments, but we hope that you, EPA and MDNR, are truly listening to these members of the public who have been following and participating in the progress of the "cleanup for many years; some even before the DOE's efforts started" (quote from attendee at public meeting). It is important that all of the comments are thoroughly evaluated and a response developed for each one that indicates how the comment will be addressed and the rational behind the response.

The large number and tenor of the comments are a clear indication of the substantial involvement of the public and the complexity of the issues, as perceived by the public, concerning this site. The public comments reflect serious concerns regarding the final solution for the GWOU and future stewardship at the Weldon Spring site. We strongly urge you to pay serious attention to the public concerns because they were not lightly voiced.

F-2 Based on the information presented at the Public Meeting, it is also apparent that the cooperative efforts between DOE and MDNR that were responsible for producing the PP may not extend to the approval process. The current relationship between the two agencies is detrimental to the process and the overall path forward. The Commission asks that the two agencies fix this problem and get to the business at hand. We believe a formal agreement between DOE, EPA and MDNR, that defines the roles of each agency, as well as appropriate funding to carry-out their roles, will help to resolve the situation.

026191
SEP - 2 2003

Response F-1: DOE will consider all comments received that are relevant to the GWOU.

Response F-2: DOE appreciates the Commission's position that DOE and MDNR must continue to work cooperatively together. DOE is currently negotiating with both EPA and MDNR regarding a post-closure agreement that will better define the roles of the agencies. The Commission should realize that there will be subject matters upon which the DOE and MDNR may not be able to reach agreement, but DOE is committed to continuing the dialog and debate in the hope of finding common ground on as much as possible.

F-2 cont. As we have previously stated, our goal is to help all parties move forward with a solution that protects the health and safety of the large community involved and one that meets the concerns of the public.

Sincerely,
WELDON SPRING CITIZENS COMMISSION
Rick Hampel, Chair
Paul Mydler, Vice-Chair
Deborah Aubuchon
Fritz Hoffmeister
Donald Price
Thomas Nelsen
Larry Sharp

Cc: Mike Duvall, Deputy Director, SCC Div. Of Environmental Services
Mimi Garstang, Director, GSRAD
Dave Geiser, Director, USDOE Office of LTS
John Hoskins, Director, MDOC
Ben Moore, Environmental Engineer, MDNR
Joe Ortwerth, County Executive, SCC
Ray Plieness, Deputy Director, USDOE-GJO
Dan Wall, Project Manager Superfund Division, USEPA-Region VII

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Weldon Spring Citizens Commission
7295 Highway 94 South
Saint Charles, Missouri 63304

September 2, 2003

Ms Pamela Thompson
U.S. Department of Energy,
Weldon Spring Site Remedial Action Project
7295 Highway 94 South
Saint Charles, Missouri 63304

Dear Pam:

This letter and the attached comments are to serve as public comment from the Weldon Spring Citizens Commission (WSCC) on the following documents:

- *Proposed Plan for Final Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area, August 2003* (DOE/GJ79491-931) *and*
- *Supporting Evaluation for the Proposed Plan for Final Remedial Action for the Groundwater Operable Unit, August 2003*(DOE/GJ/79491-939).

G-1 The WSCC supports the Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources in the selection of Alternative 3, Monitored Natural Attenuation (MNA) with Institutional Controls (ICs) as the current best solution for the Groundwater Operable Unit (GWOU). However, issues such as trigger levels, vertical extent of the contaminants and the location and number of new wells will require further cooperation between DOE and MDNR before they are resolved. Along with our support for Alternative 3, the Commission expects that the issue of alternative and active cleanup measures be revisited during the 5-year review process when more effective technologies for groundwater cleanup are developed.

The Commission appreciates DOE's open dialog with the Commission that includes your efforts to answer our questions, address and incorporate our concerns and inform us of issues pertinent to the community. The Commission appreciates the opportunity to offer our comments concerning these issues and hopes DOE will provide us with early responses to our comments well before the final PP is issued.

Sincerely,
WELDON SPRING CITIZENS COMMISSION
Rick Hampel, Chair
Paul Mydler, Vice-Chair
Deborah Aubuchon
Fritz Hoffmeister
Donald Price
Thomas Nelsen
Larry Sharp

026192
SEP - 2 2003

Response G-1: DOE appreciates the Commission's support for the Proposed Plan. The Commission should realize, however, that if the selected remedy remains protective there is no requirement to evaluate new technologies during the Five-Year Review process. If a new technology emerged that was clearly more cost effective than MNA, DOE would examine it. Should an alternative to MNA be needed, it will be implemented in accordance with the CERCLA process for post-ROD changes. If the remedy requires immediate action, a time-critical removal will be conducted in accordance with CERCLA. Alternatives to MNA will be reevaluated and will include ICO as well as other treatment or containment technologies that may be available in the future. DOE also reminds the Commission that the Proposed Plan is final and will not be revised or reissued. All relevant comments were considered in selecting the remedy presented in the ROD.

Cc: Gale Carlson, Assessment Unit Chief, Dept. of Health
Mike Duvall, Deputy Director, SCC Div. Of Environmental Services
Mimi Garstang, Director, GSRAD
Dave Geiser, Director, USDOE Office of LTS
John Hoskins, Director, MDOC
Ben Moore, Environmental Engineer, MDNR
Joe Ortwerth, County Executive, SCC
Ray Plieness, Deputy Director, USDOE-GJO
Dan Wall, Project Manager Superfund Division, USEPA-Region VII

Attachments (2)

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Weldon Spring Citizens Commission
Comments on the Proposed Plan

G-2 Comment 1 – The Commission supports a formal agreement between DOE and MDNR that would obligate MDNR to provide oversight for the many years to come.

G-3 Comment 2 – The Commission is in favor of some signage that indicates that residual uranium, nitrate etc are present at such places as Burgermeister Spring, the Southeast Drainage and any other locations that the public may actually come into contact with. The Commission is not requesting warning signs, merely informational signs.

G-4 Comment 3 – Page 4, Nitrate – Could you include some of the discussion that was present in the Supporting Evaluation (p. 19) concerning nitrate and infants? The discussion was very informative. Could the concentrations of nitrate present at Burgermeister Spring induce methemoglobinemia in an infant after drinking the water once or twice or is the high hazard index based on an infants daily consumption over it's lifetime? Can you clarify this portion of the text presented on page 19?

G-5 Comment 4– Page 5, bottom of the page – Is Burgermeister Spring literally the northern extent of direct groundwater transport from the site? No groundwater from the site moves beneath the spring?

G-6 Comment 5 - Page 8, Second paragraph, second sentence, discussion of ROD and IROD – Could this be restated in terms that are more easily understood?

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Response G-2: See response to comment F-2. The agreement currently under discussion would not obligate MDNR to provide oversight. It would provide that opportunity in a well defined and structured format. If MDNR failed to provide oversight and review of documents, no recourse would be available to DOE or EPA.

Response G-3: DOE has considered this issue in depth. Our position has always been that warning signs are not necessary. The Commission is requesting informational signs that address residual contamination. DOE has facilitated discussion of signage (historical markers) with an ad hoc committee and is prepared to address this matter in that forum. We hope that the outcome will satisfy this comment.

In reevaluating its position, DOE sought a comparison. We looked at the Times Beach cleanup of dioxin. This cleanup was led by EPA Region VII, in close coordination with the MDNR, which now owns the properties as a result of a federally funded buy-out. According to EPA, the cleanup was to an unrestricted use standard, yet residual dioxin remains and the MDNR regulates the disposal of dioxin containing materials from this site. The site is a State Park with a Route-66 museum. No information is readily available at the site to indicate it ever was the scene of a massive toxic waste cleanup. DOE is not suggesting this is inappropriate, but rather that DOE should not be held to a different standard. Signs that suggest an area may be contaminated or used to be contaminated are unwarranted if a scientific basis has been established that these areas pose no risk to the public in their current use.

Response G-4: The discussion requested is also presented in the Baseline Risk Assessment Report prepared for the GWOU. The assessment for Burgermeister Spring assumed that an infant would drink 0.64 L from the spring 20 times in one year (for the nitrate calculation the number of years does not change the result). Using this assumption, the nitrate hazard quotient for the infant would be 0.002, which is 500 times less than the level of concern (that is, 500 times less than a hazard quotient of 1).

Response G-5: Burgermeister Spring is the primary resurgence point for groundwater originating from the chemical plant area. It is likely that some groundwater does flow beneath this spring and continues on to Dardenne Creek, however, the uranium levels in Dardenne Creek do not indicate impact.

Response G-6: The coordination between the IROD and the final ROD will be clarified in the GWOU ROD.

Weldon Spring Citizens Commission
Comments on the Supporting Evaluation

G-7 Comment 1 – The Commission appreciates the inclusion of trigger levels and corresponding actions and expects DOE and MDNR to arrive at an agreeable solution to the actual numbers. However, *changes in concentration*, in addition to triggers, are great indicators of potential problems. For example, suppose the concentration of TCE in a downgradient well (weathered) goes from 1or 2 ug/L to 10 ug/L, but has not reached a trigger level. The Commission considers this a "significant" change. Will changes in concentrations of the contaminants within and outside the plume result is some action such as additional monitoring or an evaluation to determine the cause? If so, can you define for the Commission, what DOE considers a "significant" change?

G-8 Comment 2 – The trigger levels, that monitor movement of the plume, are based on wells located downgradient of the plume. Does this cover sentinel wells that are downgradient, but not directly in the flow path? What happens if hydraulic changes occur, that redirects the flow toward Burgermeister along a similar but slightly different pathway? Will sentinel wells downgradient, but not directly in the current flow pathway, be monitored to detect an aberrant movement of the groundwater? In other words, are there enough wells selected for future monitoring that will include this situation?

G-9 Comment 3 – Page 46, third paragraph, third line – The text states that "uranium could be sorbed by sedimentary material or plants in the spring." What levels are currently present in the sediment and the plants? In the future, does DOE plan to test sediment and plant matter in the Spring?

G-10 Comment 4 – Page 46, paragraph 4, line two – The text indicates that potentially contaminated water would flow into Lake 34 and then to Dardenne Creek. Have levels in Dardenne Creek always been below background? Does DOE plan to sample Dardenne Creek and the sediment and surface water in the lakes in the future? The Commission is in favor of the collection of sediment, surface water and fish tissue from Lake 34 on a regular basis.

G-11 Comment 5 – Page 55, third paragraph – The text states that 5-year reviews would be conducted because "contaminants would remain in the site groundwater at levels above those that allow unlimited use and unrestricted exposure." Does this statement also include Burgermeister Spring and the Southeast Drainage? If it does, could these two areas be added to the above statement? Aren't ICs required and planned for these two areas? The Commission also recommends signage.

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Response G-7: DOE will continue discussions with MDNR to try to reach agreement on trigger levels. The Commission is correct that concentration increases should trigger more monitoring and data evaluations. The tables in chapter 5 of the Supporting Evaluation indicate that in most cases, DOE will compare an increase in concentration to its baseline condition and take an initial response based on a statistically significant increase. This has initially been define as the arithmetic mean plus three standard deviations based on the 2001 and 2002 data set. In wells that show no current impact, DOE has suggested that a low value, slightly above the detection level, would be the appropriate initial trigger to increase monitoring.

Response G-8: Monitoring wells that are not in the flow path have not been selected for monitoring of groundwater quality. However, groundwater elevation will be monitored in a larger group of wells, which may include downgradient wells not directly on the flow path. The final list of wells will be established during the remedial design phase of the project. These wells will be monitored to identify any changes in the groundwater flow conditions in order to respond accordingly.

Response G-9: DOE does not plan on sampling the sediment and plants in Burgermeister Spring as part of the long-term monitoring from the Groundwater Operable Unit. Uranium levels in Burgermeister Spring range between 0.95 pCi/g to 68 pCi/g, as reported in the Baseline Risk Assessment.

Response G-10: Uranium levels in Dardenne creek downstream from Lake 34 have ranged from < 0.68 pCi/l to 3.1 pCi/l. Upstream (background) uranium levels have ranged from < 0.68 pCi/l to 4.8 pCi/l. This data would indicate that uranium levels downstream from Lake 34 have not indicated impact. Since impact has not been indicated, sampling of Dardenne Creek has not been included in the monitoring program for the GWOU.

Routine sampling of surface water, sediment, and fish in Lake 34 is not included in the monitoring program for the GWOU at this time. Fish sampling has been included as a contingency action if uranium levels in Burgermeister Spring exceed 300 pCi/l. The final development of the program will be made during the remedial design phase of the project. Inclusion of sampling in Lake 34 will be considered during this process.

Response G-11: DOE considers the groundwater contamination to include the impacted springs, since springs are an expression of groundwater. Springs can also be influenced by surface water runoff. Every commitment made regarding contaminated groundwater applies to the springs and DOE will attempt to clarify language such as suggested by this comment in the Record of Decision. The two areas mentioned, Burgermeister Spring and Southeast Drainage, are included in the areas requiring institutional controls. DOE's response to Comment G-3 addresses our position on signage.

September 3, 2003

Mr. David Geiser
U.S. Department of Energy
Office of Long Term Stewardship, EM-51
1000 Independence Ave., SW
Washington, D.C. 20585

RE: PROPOSED PLAN FOR FINAL REMEDIAL ACTION FOR THE GROUNDWATER OPERABLE UNIT AT THE CHEMICAL PLANT AREA OF THE WELDON SPRING SITE, WELDON SPRING, MISSOURI (August 2003)

and

SUPPORTING EVALUATION FOR THE PROPOSED PLAN FOR FINAL REMEDIAL ACTION FOR THE GROUNDWATER OPERABLE UNIT AT THE CHEMICAL PLANT AREA OF THE WELDON SPRING SITE, WELDON SPRING, MISSOURI (August 2003)

H-1 Dear Mr. Geiser:

The Missouri Department of Natural Resources received the Groundwater Operable Unit (GWOU) Proposed Plan and Supporting Evaluation on August 4, 2003, for review, comment, and possible concurrence. We appreciate the opportunity to comment and participate in this review process. As you know, the state of Missouri has noted we can support the Department of Energy's (DOE) proposal of "monitored natural attenuation" – (leaving contaminated ground water in place) but only if some important technical and institutional conditions have been defined. Regrettably, even after continued coordination between this department and yours, the Department of Natural Resources can not concur with the proposed remedial action as presented in this Proposed Plan because it does not provide adequate protection for Missourians. Too many important details remain absent from this plan for our department to provide concurrence at this time. To reiterate this department's concerns, I have enclosed a copy of our comments for

Response H-1: MDNR's position on the remedy will be included in the Declaration Statement of the Record of Decision.

H-1 cont. you to address before continuing with the GWOU Record of Decision. I would like to personally bring to your attention several very important issues this department continues to have with the DOE's Proposed Plan.

H-2 **Monitoring System**
DOE has stated; due to the complex hydrological conditions at this site, conventional and currently available innovative techniques are ineffective in remediating groundwater. Complexities included a groundwater divide, karst conduit systems, and paleochannels. These features resulted in a highly complex aquifer with heterogeneous and anisotropic characteristics. The department agrees that these characteristics make conventional treatment difficult at this site. The department also believes these characteristics make the need for a detailed monitoring system, including vertical monitoring with conservative trigger levels, even more important so the MNA alternative can be protective of human health and the environment. The Proposed Plan does not contain this sort of monitoring system or trigger levels. The department believes if appropriate trigger levels are not set prior to finalizing the GWOU Record of Decision, the department must have the ability to legally concur with the Remedial Design/Remedial Action report, that defines these details. Since contamination levels at Burgermeister Spring fluctuate significantly, a conservative, protective plan should also include regular fish tissue sampling and passive treatment of contaminated groundwater currently discharging at Burgermeister Spring.

H-3 **Federal Facilities Agreement**
The department continues to insist that we become a full partner to an appropriately updated Federal Facilities Agreement (FFA). The Environmental Protection Agency, DOE, and this department have all agreed to this in concept. I recommend we use the latest model FFA to develop a document that all the parties can review, comment on, and agree to, concurrent with development of the plan to address the groundwater. The revised FFA document must be in place before or concurrent with execution of the GWOU ROD. This process is consistent with assurances offered by DOE that the state would become a signatory with enforcement authority at the signing of the final site ROD. This approach helps ensure that this department will be able to represent the public's future concerns.

H-4 **Long-Term Stewardship**
As this is the final ROD for this site, the actions or inaction now in proposing how to address contaminated groundwater existing on or emanating from this site, are critical and will continue to be for future generations. It is vital that the plan includes the establishment of the necessary institutional controls to inform future owners and users of the property adjacent to the cell, as well as impacted neighbors such as the Missouri Department of Conservation, so as to minimize exposure of those same individuals to residual radioactive or hazardous wastes. Such a decision is one we do not take lightly. In the rapidly growing county of St. Charles, where this site is located, useable land and water resources remain at a premium. We anticipate continued growth

Response H-2: DOE maintains that the proposed monitoring system is adequate to demonstrate monitored natural attenuation. We continue to be willing to discuss further enhancement to the system. State acceptance of the remedy is a goal of the CERCLA process, but not a legal requirement. MDNR will continue to have opportunities to review the details of the monitoring system.

Response H-3: DOE maintains that the status of a post-closure agreement should not impact the State's position on the protectiveness of the remedy.

Response H-4: DOE agrees that a Long Term Surveillance and Maintenance (LTS&M) plan is necessary for the site and believes that we have made tremendous progress toward that end, with the help of both the regulatory agencies, the surrounding property owners, and the concerned citizens.

H-4 cont. and pressure for "clean" and "safe" areas to live, work and/or visit for recreation. We must ensure that our decisions today are fully protective for the future.

H-5 The GWOU ROD must have the Stewardship Plan incorporated as a major component since the protectiveness of the remedy is reliant on long-term stewardship, long-term monitoring, and long-term maintenance. Adequate long-term stewardship must include provisions for secure, long-term funding for maintenance, monitoring and continued state oversight along with clear enforcement authority.

As stated previously, this department remains concerned about the DOE's Proposed Plan for addressing groundwater. We must be confident that the plan for long term monitoring of the contaminated groundwater will produce the necessary data to prove to ourselves and the public that contamination is truly attenuating, and contaminant migration is not creating unacceptable risks to the people who live, work, and play near the site. DOE is obligated to achieve this same goal.

I have compiled a set of detailed comments that should be addressed before the GWOU ROD. If you have any questions about the basis, meaning or intent of any of the comments do not hesitate to call me at (573) 368-2100, or Robert Geller at (573) 751-3907, immediately. Written inquiries may be directed to me at P.O. Box 250, Rolla, MO 65401, or to Mr. Geller at the Hazardous Waste Program, P. O. Box 176, Jefferson City, MO. 65102-0176. We look forward to working with you to create an adequate plan for addressing the groundwater contamination at the Chemical Plant Site that everyone can support with confidence.

Thank you for your attention to this critical matter.

Sincerely,

GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION

Mimi R. Garstang, RG
Director and State Geologist
Director's Office - Administration Program
573/368-2101
573/368-2111 (Fax)
nrgarsm@mail.dnr.state.mo.us

MG:led

Enclosure

Response H-5: The RD/RA Workplan for the Groundwater Operable Unit will comprise the basis for a major element of the LTSM Plan, establishing the monitoring program for the MNA remedy and the institutional controls necessary to maintain protectiveness. The LTSM Plan itself will be a CERCLA deliverable document. Provisions for secure long term funding are beyond the constitutional scope of the executive branch of the government. Continuing state oversight has been presented as a small scope within the cost estimate of the LTSM Plan.

c: Mr. James Gulliford, U.S. Environmental Protection Agency-Region VII
Ms. Pam Thompson, WSSRAP Project Office
Mr. Dan Wall, U.S. Environmental Protection Agency-Region VII
Weldon Spring Citizens Commission

bc: Mr. Edward Galbraith, Director – Hazardous Waste Program
Mr. Robert Geller, Federal Facilities Section
Mr. Ray Plieness – U.S. Department of Energy
Mr. James D. Werner, Director – Air and Land Protection Division

Comments

Proposed Plan for Final Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site, Weldon Spring, Missouri, August 2003

General Comments:

H-6 Institutional controls are an integral component of the proposed remedy. The department will not consider the remedy complete or protective until all components of the remedy are in place, including institutional controls.

While not directly related to comments on the plan, the issue of having the state as a co-signatory to the revised Federal Facility Agreement is vital to assurance of regulatory enforcement of the ROD and stewardship plan. This will also allow the department to represent future public concerns.

The Department of Health and Senior Services is committed to regular, offsite, private, drinking water well monitoring. As discussion progresses on the LTS plan the Department of Natural Resources will support the need for funding to continue this sampling near the WSSRAP. The MDNR and DHSS believe the DOE must develop a mechanism for funding of private well sampling in to the future to ensure this commitment is maintained.

The department believes the GWOU ROD must commit to a fully executed FFA that includes the state before the LTS plan is finalized.

The department believes the GWOU ROD must identify the State of Missouri as having approval authority over the remedial design (RD/RA).

The Departments of Conservation, Health and Senior Services, and Natural Resources agree that fish sampling should be conducted on a regular basis to verify conditions are protective. This will ensure the public is well informed about the conditions of fish in the area.

Enclosed are comments prepared by the Missouri Department of Conservation. These comments are submitted and should be addressed in the responsive summary.

The Department of Transportation and this department believe that signs should be erected near the two culverts under Highway 94 and State Road D. These signs would inform the potential construction worker of the need to call the DOE for further information. This comment can be addressed in the LTM plan.

Detailed Comments:

H-7 **Comment 1)** Page 3, The plan states 1,3,5-TNB is a contaminant of concern (COC). Page 10 of the plan lists the ARARs and RBCs. Previous versions of this plan have included a RBC for 1,3,5-TNB. This plan fails to include a RBC for the COC 1,3,5-TNB. Please explain this omission.

Response H-6: Most of these general comments are reiterated in specific comments. See responses H 1, 3, 4, & 5, and I1 to I6. See response G-3 with regards to comment about signs at highway culverts.

DHSS has conducted private water well sampling in the surrounding area since 1982 and to our knowledge has never identified a contamination issue attributed to the DOE site. Given our understanding of the groundwater flow patterns and the locations DHHS monitors, DOE cannot technically support this monitoring program and therefore cannot financially support it either. DOE will continue our monitoring program in the impacted areas and the potentially impacted areas.

Response H-7: 1,3,5-TNB was included as a COC on page 3 of the Proposed Plan in error. This particular nitroaromatic compound was determined to be at levels that are already protective based on a recalculation of the risk-based concentration for it as explained on page 44 of the Supporting Evaluation Report. The reference dose (RfD) for 1,3,5-TNB was revised by the EPA since the RI/FS documentation preparation. Based on the revised RfD from the EPA database, the RBC that is equivalent to a hazard index of 1 for a resident scenario for 1,3,5-TNB is estimated to be 1,100 µg/L as opposed to the previously estimated RBC of 1.8 µg/L. Concentrations of 1,3,5-TNB (both historical and current) have not exceeded 1,100 µg/L. For this reason, 1,3,5-TNB was excluded from the list of COCs.

H-8 **Comment 2)** Page 4, Uranium section, The plan states, "Contamination is primarily limited to the weathered portion of the shallow aquifer." The document continues by naming the two wells currently contaminated, MW-3024 and MW-3030. The monitoring well with the highest concentration of uranium is MW-3024, which is depicted on figures 2 and A.3 as a well monitoring the unweathered portion of the aquifer. This suggests that the uranium contamination is predominantly in the unweathered portion of the Burlington-Keokuk Limestone.

H-9 **Comment 3)** Page 5, last paragraph, The plan states "Water discharged at Burgermeister Spring then mixes with other surface water and with ponded water in Lake 34." Either in the plan it is stated that Burgermeister Spring discharge concentrations range from 8.6 to 100 pCi/l. This information leads to the question of what impact has this had on fish in Lake 34? The DOE sampled fish in 1993 but only took fillet samples. The department suggests annual sampling of fish samples to ensure the public is well informed about the conditions of fish in the area.

H-10 **Comment 4)** Page 6, first complete paragraph. The plan states ". . . and no groundwater contamination attributable to the Chemical Plant site is present south of the divide . . .." Although the department understands the purpose of this statement and paragraph, we also find this statement potentially misleading. Currently, contaminated groundwater attributable to the Chemical Plant exists south of the groundwater divide. The contaminated groundwater in the Southeast Drainage is a prime example. The department suggests the information in this paragraph be rewritten to reflect this fact.

H-11 **Comment 5)** Page 8, first part paragraph. The plan states "although the MCL of 5 µg/l was not sustained throughout the plume.". This statement is misleading since the Interim Action was not designed to treat TCE throughout the plume. A more accurate statement would be "although the MCL of 5 µg/l was not sustained in the treatment area." This could be followed by a brief statement explaining why the MCL was not sustained.

H-12 **Comment 6)** Page 9, Figure 2.4 Uranium Contamination Contour for 2002 at the Chemical Plant Area. There are no unweathered wells located east or southeast of the uranium plumes illustrated in this figure. It also appears that the plume drawn around MW-3024 incorporates data from weathered zone wells with data from MW-3024, an unweathered zone well. The justification of this is not clear, particularly in light of the fact that the two zones exhibit different characteristics: e.g., the weathered zone well, MW-3025, adjacent to MW-3024 has a higher water level and lower uranium concentration than MW-3024. Additional unweathered wells are required in these locations to further characterize the horizontal and vertical extent of uranium contamination.

H-13 **Comment 7)** Page 11, first complete paragraph. The plan states "These ICs would be indefinite-term licenses, easements, or permits, as applicable." The State of Missouri recommends the DOE include the State Registry in this list of ICs. As part of the ICs available, DOE can volunteer to be included on the registry or the department can place areas of this site on the registry.

Response H-8: The data from MW-3024 was used to depict the distribution of uranium because data from this well likely represents impact from the weathered zone. This conclusion has been made based on hydrologic information for this location and inference from behavior of other unweathered wells at the Chemical Plant.

Response H-9: Fish samples were collected from Busch Lake 34 on seven different occasions during a ten-year period (between 1987 - 1996). Samples were analyzed for uranium each time and also for metals on four separate events. All sample types were represented, including whole fish, fillets, and fishcakes. Samples were no longer collected from Lake 34 after it was determined that uranium concentrations in fish were not significantly different from background fish samples (*Radiological and Chemical Uptake in Game Species at the Weldon Spring Site*).

Response H-10: Historically, contaminated groundwater originating from the Raffinate Pit #1 and #2 area did migrate toward the Southeast Drainage and discharge at the springs. However, it is likely that the majority of the contaminants discharged through the overflow structures of these raffinate pits, discharging to the Southeast Drainage though the process sewer lines. Concentrations of the COCs in monitoring well MW-4026, located at the bottom of the drainage, do not indicate groundwater impact. The impacted springwater in this drainage is the result of desorption and dissolution of residual contamination in the fractures of the losing portions of the drainage.

Response H-11: DOE agrees that the initial phase of the ICO treatment did not target the entire plume. We clarified the discussion of the ICO treatment in the ROD.

Response H-12: See response to Comment H-8.

Response H-13: Since the site is already on the National Priorities List, it is also discussed in the State's Registry. DOE would like to work with MDNR to revise the description of the site in this state document in order for it to reflect the current conditions.

H-14 **Comment 8)** Page 15, first complete paragraph. Contingencies are defined in this paragraph. The DOE has previously committed to conducting fish sampling as a contingency if uranium concentrations at Burgermeister Spring reach the historical highs that occurred during the timeframe of the bio-0uptake sampling efforts. This contingency should be added to this paragraph. Generic language would be appropriate.

H-15 **Comment 9)** Page 15, second column, first part paragraph. The plan states "Active treatment alternatives have been investigated and determined to be ineffective." This statement is not factual. Active treatment of TCE was proven to be effective at the pilot scale. Localized treatment of TCE is effective. The department suggests rewording this sentence to include localized treatment of TCE is effective and hot spot treatment is predicted to be effective.

H-16 **Comment 10)** Page 15, second complete paragraph. The department does not agree with the design as detailed in the referenced supporting evaluation report. Please refer to the detailed comments on the supporting evaluation report.

H-17 **Comment 11)** Appendix A, This version of the plan does not contain a contaminant contour map for the COC 1,3,5-TNB. Please explain this omission.

Response H-14: This summary paragraph was not intended to reiterate in detail all possible activities. DOE will clarify fish sampling either in the Record of Decision or the RD/RA Work Plan.

Response H-15: This was a summary statement concerning all of the contaminants of concern. DOE agrees that ICO is viable as a hot spot treatment process for TCE only.

Response H-16: See responses to Comments H-18 through H-58.

Response H-17: 1,3,5-TNB was included as a COC on page 3 of the Proposed Plan in error. This particular nitroaromatic compound was determined to be at levels that are already protective based on a recalculation of the risk-based concentration for it as explained on page 44 of the Supporting Evaluation Report. The reference dose (RfD) for 1,3,5-TNB was revised by the EPA since the RI/FS documentation preparation. Based on the revised RfD from the EPA database, the RBC that is equivalent to a hazard index of 1 for a resident scenario for 1,3,5-TNB is estimated to be 1,100 µg/L as opposed to the previously estimated RBC of 1.8 µg/L. Concentrations of 1,3,5-TNB (both historical and current) have not exceeded 1,100 µg/L. For this reason, 1,3,5-TNB was excluded from the list of COCs.

Comments
8/27/2003
Supporting Evaluation for the Proposed Plan for Final Remedial Action for the Groundwater Operable Unit at the Chemical Plan Area of the Weldon Spring Site, Weldon Spring, Missouri

H-18 **General Comments:**

Several of the plan's proposed action levels and the number and location of monitoring locations are unacceptable. Since the shallow groundwater system is hydrogeologically complex, additional monitoring wells beyond those proposed will be needed to provide a comprehensive and acceptable monitoring system. More conservative trigger levels are needed in several instances to provide a factor of safety in this complex hydrogeological environment to be fully protective on human health and the environment.

H-19 **Detailed Comments:**

Comment 1) Section 2.1.1 Groundwater, page 5. The contaminants of concern listed in the first paragraph do not match the COCs listed in the proposed plan. The nitroaromatic compound 1,3,5-trinitrobenzene (1,3,5-TNB) is listed as a COC in the proposed plan but has been omitted in the supporting evaluation. Please explain this discrepancy and omission.

H-20 **Comment 2)** Figures 2.1 through 2.8, This version of the evaluation does not contain a contaminant contour map for the COC 1,3,5-TNB. Please explain this omission.

H-21 **Comment 3)** Page 5, Section 2.1.1 Groundwater, The document refers to figures 2.2 through 2.7 to depict locations exceeding water quality standards or risk-based concentrations (RBCs). These figures only depict the horizontal extent of contamination. Please include maps representing the three dimensional extent of contamination. From our understanding, DOE has had the information to produce these maps since the Remedial Investigation, except for the TCE. Additional monitoring will be needed to define TCE vertical extent. In addition, citizens at the PP public meeting requested these three dimensional maps.

H-22 **Comment 4)** Page 13, fourth paragraph. The document states "Uranium contamination occurs predominantly on the Chemical Plan site in the weathered unit of the Burlington-Keokuk Limestone." The document continues by naming the two wells currently contaminated, MW-3024 and MW-3030. The monitoring well with the highest concentration of uranium is MW-3024 which is depicted on figures 2.1 and 2.4 as a well constructed in the unweathered portion of the aquifer. This suggests that uranium contamination is predominantly in the unweathered unit of the Burlington-Keokuk Limestone.

H-23 **Comment 5)** Page 14, Section 2.1.2 Spring Water, The last sentence of this section states that, "Nitrate and TCE were not detected in this spring." According to the records provide to this department by the DOE, nitrate was detected in SP-5304 during 2002. These detections were below the MCL of 10 μg/l.

Response H-18: see response H-2

Response H-19: 1,3,5-TNB was included as a COC on page 3 of the Proposed Plan in error. This particular nitroaromatic compound was determined to be at levels that are already protective based on a recalculation of the risk-based concentration for it as explained on page 44 of the Supporting Evaluation Report. The reference dose (RfD) for 1,3,5-TNB was revised by the EPA since the RI/FS documentation preparation. Based on the revised RfD from the EPA database, the RBC that is equivalent to a hazard index of 1 for a resident scenario for 1,3,5-TNB is estimated to be 1,100 µg/L as opposed to the previously estimated RBC of 1.8 µg/L. Concentrations of 1,3,5-TNB (both historical and current) have not exceeded 1,100 µg/L. For this reason, 1,3,5-TNB was excluded from the list of COCs.

Response H-20: A contaminant contour map for 1,3,5-TNB was not included because current (and historical) concentrations do not exceed 1,100 µg/L which would be the risk-based concentration for it. See also response H-19.

Response H-21: The text discusses that groundwater contamination is present primarily in the weathered portion of the Burlington-Keokuk Limestone. The depth of the weathered unit ranges from 30 ft to 65 ft below the ground surface in the area of groundwater impact. The depth to the top of the weathered unit ranges from approximately 50 to 75 ft below the groundwater surface. A three-dimensional depiction is not necessary to understand the extent of groundwater impact at the site.

Response H-22: See response to comment H-8.

Response H-23: The text in the Record of Decision was revised to state that a nitrate concentration of 1.9 mg/l was detected in 2002.

H-24 **Comment 6)** The document states "Water discharged at Burgermeister Spring then mixes with other surface water and with ponded water in Lake 34." Elsewhere in the plan it is stated that Burgermeister Spring discharges uranium concentrations that range from 8.6 to 100 pCi/l. This information brings into question what impact this has had on fish in Lake 34. The DOE sampled fish in 1993 but only analyzed fillet samples. The department suggests annual analysis of whole fish samples to ensure that the public is well informed about the conditions of fish in the stream receiving impacted groundwater from the site.

H-25 **Comment 7)** Pages 15-17, last paragraph on page 15. Page 15, Section 2.2.1 Geology and Hydrogeology, last complete paragraph, The statement that "no groundwater contamination attributable to the Chemical Plant site is present south of the divide therefore there is no groundwater component to the contamination present in the downgradient springs" is not supported by 2002 sampling results from SP-5304. Uranium sampling data from SP-5304 in 2002 ranged from between 9.4 and 103 pCi/l (Section 2.1.2 Spring Water). Also in 2002 there were detections of 2,4,6-trinitrotoluene (2,4,6-TNT) in SP-5304. Another statement in the same paragraph ("springs in the Southeast Drainage act as end points of *direct* (emphasis added) groundwater transport for the Chemical Plant Area and provide ideal locations for monitoring groundwater contamination") contradicts the preceding quote. The department suggests the information in this paragraph be rewritten to reflect this fact.

H-26 **Comment 8)** Section 3.1.2 Results of the Field Studies, paragraph three, page 30. The last sentence of this paragraph has been significantly revised since the March 2003 draft Proposed Plan. For example, in the draft document it is stated that extracting water from the more transmissive portions of the shallow aquifer would effectively remediate the groundwater in this area. In the August 2003 revision of the Proposed Plan the term "effectively remediate" has been changed to "remove" and "this area" has been changed to "a small discrete area". Actually, the capture area illustrated by the DOE during the additional field study was quite large. We suggest future explanations of the field study be more factual.

H-27 **Comment 9)** Page 38, last paragraph, The document states "It was envisioned in the IROD that two sets of wells and two injections would achieve the MCL." The department disagrees with this interpretation of the IROD. The IROD states "the need for the installation of approximately two sets of nested application or injection wells, with multiple rounds (at least two) of chemical reagent application." The terms "two sets of nested application or injection wells" referred to two rows of several injection wells that may have included many more wells than just two. Also the IROD refers to multiple rounds of chemical application. Two rounds were considered a minimum.

H-28 **Comment 10)** Page 49, Section 3.5.2 Evaluation of ICs for Application at the Chemical Plant Area, Institutional controls are an integral component of the proposed remedy. The department will not consider the remedy complete or protective until all components of the remedy are in place, including institutional controls.

H-29 **Comment 11)** Page 49, Section 3.5.2 Evaluation of ICs for Application at the Chemical Plant Area, The State of Missouri recommends the DOE include the State Registry as a viable ICs. As part of the ICs available, DOE can volunteer to be included on the registry or the

Response H-24: See response to Comment H-9.

Response H-25: See response to Comment H-10.

Response H-26: The information presented in the Supporting Evaluation is factual. Although the capture area of the well was quite large, the affect that the pumping of water had on the contaminant distribution was negligible. The rates of removal were low and resulted in removing groundwater from a discrete area of the aquifer. Due to the limited recharge of the aquifer it is unlikely that this method would effectively remediate the groundwater in this area.

Response H-27: DOE does not agree with MDNR's interpretation of the IROD language. The scope of this effort is also defined in the Feasibility Study. DOE exceeded the capital cost estimate from the FS in the implementation of the initial phase of the ICO. Whether or not "nested wells" might mean "rows of wells," the conclusion of the ICO treatment effort was that its effects are localized and its sphere of influence are unpredictable in the complex hydrogeological setting at the site.

Response H-28: DOE agrees with MDNR.

Response H-29: See response H-13

H-29 cont. department can place areas of this site on the registry. This would be considered as an added layer to the ICs that would be implemented.

H-30 **Comment 12)** Page 57, Section 4.3.1 Description, third paragraph, The last sentence contains a typographical error. Section 3.1.2.1 does not exist.

H-31 **Comment 13)** Page 65, Section 5.2 PROPOSED PERFORMANCE MONITORING STRATEGY, last paragraph, The document states "For uranium, the contingencies include additional fish sampling at Lake 34.". This statement is not reflected in Table 5.3 as a contingency.

H-32 **Comment 14)** Page 67, Table 5.1, According to the table, a previously proposed unweathered-zone well, UW-2 (to be located near MW-3034) was deleted from this monitoring plan. The identified unweathered-zone well, UW-1 (originally to be located near existing well MW-4031) has now, according to this table, been relocated to the MW-4037 area in the leading edge of the TCE plume. Without these wells in the highest TCE concentration areas, a remedial objective of MNA, to verify that vertical expansion of the TCE plume is not occurring, cannot be accomplished. The previous agreement of the technical review team was to install two new unweathered monitoring wells, one adjacent to MW-4031 and one next to MW-3034. These new wells are necessary to properly delineate the vertical extent of TCE contamination and will help fulfill Objective A. DOE should take the appropriate precaution during installation to minimize migration caused by improper installation techniques.

H-33 **Comment 15)** Table 5.1, In several places this table states "...if TCE concentrations in the center of the plume have dissipated to <300 µg/l.". In all occurrences, the department believes a more appropriate level to be <50 µg/l.

H-34 **Comment 16)** Page 70, The proposed Objective C trigger of 75 µg/l TCE at monitoring well W-1 is unacceptable. This trigger should be 10 µg/l at this location. The In-situ Chemical Oxidation (ICO) hot spot trigger should also be 10 µg/l.

H-35 **Comment 17)** Page 71, The proposed Objective C trigger concentration at MWS-1, 20 µg/l is unacceptably high. A more appropriate trigger concentration for MWS-1 located at the federal property boundary would be a more protective concentration level of 5 µg/l (the MCL).

H-36 **Comment 18)** Page 72, Trigger Concentration or Event Column, The word "well" should be "spring".

H-37 **Comment 19)** Page 75, Table 5.2, No characterization (Objective A) wells are included in this table to confirm the extent of the nitrate plume in the vertical direction. Without these wells beneath the highest nitrate concentration areas, a remedial objective of MNA, to verify that the vertical expansion of the nitrate plume is not occurring, cannot be accomplished. Monitoring wells 3024, 3026, and 4011 are all nitrate contaminated wells screened in the unweathered zone. The department recommends installation of three wells in the unweathered portion at location beneath MW-3024, MW-3026, and MW-4011. These, in

Response H-30: Comment noted.

Response H-31: DOE will clarify fish sampling either in the Record of Decision or the RD/RA Work Plan.

Response H-32: DOE has proposed to install at least one unweathered well to monitor for possible movement of contaminants into the unweathered unit downgradient from the locations exhibiting the highest levels of contamination. An unweathered well in the current center of the TCE plume is not warranted. The final configuration of the monitoring program will be finalized in the RD/RA Work Plan.

Response H-33: DOE does not agree with the lower concentration suggested by MDNR. Trigger levels will be finalized in the RD/RA Work Plan.

Response H-34: DOE does not agree with the lower concentration suggested by MDNR. Trigger levels will be finalized in the RD/RA Work Plan.

Response H-35: DOE does not agree with the lower concentration suggested by MDNR. Trigger levels will be finalized in the RD/RA Work Plan.

Response H-36: Comment noted. DOE will clarify this in future documents.

Response H-37: The nitrate data for the 3 mentioned wells likely represents impact from the weathered zone. This conclusion is based on hydrologic information and present and historical contaminant data from unweathered wells at the chemical plant. The vertical and horizontal extent of contamination from the groundwater COCs at the Chemical plant site was fully examined in the Remedial Investigation. Other unweathered wells, MW-3006, MW-4007, MW-2021, and MW-2022 are located beneath areas of high nitrate contamination in the weathered zone.

H-37 cont. addition to new monitoring wells nested at MW-4031 and MW-3034, will be used to help delineate the nitrate contamination in the unweathered zone. DOE should take the appropriate precaution during installation to minimize migration caused by improper installation techniques.

H-38 **Comment 20)** Page 75, Table 5.2, Trigger Concentration or Event column, b. (1), The proposed trigger concentration of 1,500 mg/l is too high. A more appropriate concentration would be 1,000 mg/l. If the concentration exceeds 1,000 mg/l the probability that MNA standard Objective B is being accomplished would be in doubt.

H-39 **Comment 21)** Page 75, Table 5.2 Preliminary MNA Performance Monitoring for Nitrate, Trigger Concentrations of Event column, b. (2), The proposed trigger of 1,000 mg/l (average of the high three concentrations) in this plan is too high. The MNA timeframes should be recalculated if the average of the high three consecutive concentrations exceeds 600 mg/l.

H-40 **Comment 22)** Page 77, Table 5.2, Two wells, MW-3026 and MW-4011 are listed as wells that monitor the unweathered bedrock unit. These unweathered unit wells show nitrate concentrations ranging from approximately 100 to 200 mg/l. If contaminants exist in the unweathered unit, appropriate monitoring locations within the unweathered unit should be included in the plan to monitor for potential spreading of these plumes.

H-41 **Comment 23)** Page 78, Table 5.2, An additional Objective C well is necessary to monitor the leading edge of nitrate contamination as it migrates off-site. This well should be located to the north of the plume and north of MW-4013. Further discussion on the specific location of this well is needed.

H-42 **Comment 24)** Page 78, Table 5.2, The Objective C monitoring well trigger is unacceptable. The trigger should be 10 mg/l instead of the proposed 500 mg/l.

H-43 **Comment 25)** Page 79, Table 5.2, The Objective D spring trigger is unacceptable. The trigger should be 10 mg/l instead of the proposed 100 mg/l.

H-44 **Comment 26)** Page 81, Table 5.3, Table 5.3 Preliminary MNA Performance Monitoring for Uranium. The table does not include Objective A characterization monitoring wells. Three new wells in the unweathered portion are required at the location of MW-3024 and MW-3030 southeast of MW-3024. These will be used to help delineate the uranium contamination. The plan must include un-impacted monitoring points in the unweathered zone (for each of the two plumes) beneath the areas of highest uranium concentration. DOE should take the appropriated precaution during installation to minimize migration caused by improper installation techniques.

H-45 **Comment 27)** Page 81, Table 5.3, The Objective B trigger is unacceptable. The trigger should be 100 pCi/l uranium instead of the proposed 300 pCi/l. No basis for the trigger concentration of 300 pCi/l is provided in this plan and the department does not consider 300 pCi/l a reasonable trigger concentration. Based upon historical records the lower concentration of 100 pCi/l is appropriate. Alternatively, use the same test given in the first tier, to determine trigger concentrations for Objective B wells.

Response H-38: DOE does not agree with the lower concentration suggested by MDNR. Trigger levels will be finalized in the RD/RA Work Plan.

Response H-39: DOE does not agree with the lower concentration suggested by MDNR. Trigger levels will be finalized in the RD/RA Work Plan.

Response H-40: See Response to Comment H-37.

Response H-41: DOE is willing to add another existing well to the monitoring program to address this comment. DOE suggests inclusion of well MWS-112. DOE does not agree with the lower concentration suggested by MDNR. Trigger levels will be finalized in the RD/RA Work Plan.

Response H-42: DOE does not agree with the lower concentration suggested by MDNR. Trigger levels will be finalized in the RD/RA Work Plan.

Response H-43: DOE does not agree with the lower concentration suggested by MDNR. Trigger levels will be finalized in the RD/RA Work Plan.

Response H-44: DOE does not agree that additional wells screened in the unweathered zone are needed at these locations. See also response to H-32.

Response H-45: MDNR did not provide any rationale for this or other suggested trigger levels. DOE does not agree with the lower concentration suggested by MDNR. Trigger levels will be finalized in the RD/RA Work Plan.

H-46 **Comment 28)** Page 81, Table 5.3, If the unexpected high concentration of 300 pCi/l occurs for two consecutive quarters with confirmatory sampling a more active response than recalculating MNA timeframes should be required. Some suggestions include: 1) determine why concentrations are increasing up to 300 pCi/l, 2) reevaluate and possibly change the site model, and 3) investigate possible unknown or un-remediated sources of contamination.

H-47 **Comment 29)** Page 81, Table 5.3, Another contingency action should be added to the second tier for Objective B wells. Because the size of the plume directly affects the MNA timeframe calculation, the contingency action of recalculating MNA timeframes should be initiated if the size of the contaminant plume changes significantly.

H-48 **Comment 30)** Page 81, Table 5.3, An unweathered-zone well MW-3024 and a weathered-zone well MW-3030 are both Objective-B wells for uranium monitoring. The two wells are monitoring different bedrock units, unweathered and weathered. This is another reason why additional unweathered-zone wells beneath both uranium plumes are necessary to fully delineate the vertical extent of uranium contamination.

H-49 **Comment 31)** Page 81, Table 5.3, For locations consistently below 5 pCi/l, the trigger concentration should be 15 pCi/l instead of 20 pCi/l (the MCL.) Such a significant increase in concentration should be evaluated before the MCL is reached. Setting the trigger concentration below the MCL would be consistent with the MNA monitoring plan for TCE.

H-50 **Comment 32)** Page 82, Table 5.3, The Objective C trigger is unacceptable. The trigger should be 20 pCi/l uranium instead of the proposed 100 pCi/l.

H-51 **Comment 33)** Page 82, Table 5.3, The proposed second-tier trigger concentration for the springs at 300 pCi/l is fifteen times the MCL at this point of exposure. A trigger concentration of 100 pCi/l, though higher than the MCL, is reasonable, based on recent sampling results and is more protective than the proposed concentration.

H-52 **Comment 34)** Page 83, Table 5.3, Only established TCE and Nitrate Objective F wells are proposed for uranium Objective F wells. A weathered well should be installed north of MW-3024 for this objective because there is insufficient coverage in this area.

H-53 **Comment 35)** Page 84, Table 5.4, No Objective A wells (unweathered-zone wells) are proposed in this plan. One MNA remedial objective, to verify vertical expansion of the nitroaromatic plume is not occurring, cannot be accomplished unless unweathered Objective A wells are located in the areas of nitroaromatic contamination near MW-2012.

H-54 **Comment 36)** Page 87, Table 5.4, Contingency Actions, Because B-2 wells are discussed on this page, it is suspected that "B-1" included here should be "B-2". In the response to this comment the error was acknowledged, but it was not corrected in August 2003 Supporting Evaluation.

H-55 **Comment 37)** Why are all triggers based on 2,4-DNT and not any of the other nitroaromatics?

H-56 **Comment 38)** Review trigger levels for nitroaromatics!

Response H-46: DOE does not agree that a trigger level should be set that would require source investigation. The suggestion to reevaluate the groundwater model would not be appropriate unless groundwater flow or groundwater elevations have changed. This is addressed within other objectives of the MNA monitoring approach.

Response H-47: A well selected for this objective will not indicate a change in the size of the plume and therefore will not impact the MNA timeframe calculations.

Response H-48: The data from MW-3024 was used to depict the distribution of uranium because data from this well likely represents impact from the weathered zone. This conclusion has been made based on hydrologic information for this location and inference from behavior of other unweathered wells at the Chemical Plant.

Response H-49: DOE does not agree with the lower concentration suggested by MDNR. Trigger levels will be finalized in the RD/RA Work Plan.

Response H-50: DOE does not agree with the lower concentration suggested by MDNR. Trigger levels will be finalized in the RD/RA Work Plan.

Response H-51: DOE does not agree with the lower concentration suggested by MDNR. Trigger levels will be finalized in the RD/RA Work Plan.

Response H-52: There is sufficient coverage across the site to fulfill Objective F using the existing monitoring well system. This issue will be finalized in the RD/RA Work Plan.

Response H-53: The final configuration of the monitoring program will be finalized in the RD/RA Work Plan.

Response H-54: Comment noted. DOE will clarify this in the RD/RA Work Plan.

Response H-55: The triggers are based on 2,4-DNT because this compound presents the lowest concentration that must be attained of all the nitroaromatic compounds. It is believed that using it as the basis for the triggers would be conservative.

Response H-56: Comment noted.

H-57 **Comment 39)** Page 91, Table 5.4, Table 5.4 Preliminary MNA Performance Monitoring for Nitroaromatic Compounds, Monitoring Well column, page 91. No springs in the Southeast Drainage are proposed for nitroaromatic monitoring. Monitoring for nitroaromatic compounds at springs in the Southeast Drainage should be included. Nitroaromatic compounds are co-located with uranium in the lower springs (SP-5303 and SP-5304). The department understands that the DOE has previously committed to sampling for contaminants of concern, nitroaromatic compounds in this case, when they are co-located with uranium.

H-58 **Comment 40)** Page 92, Table 5.4, There are no proposed Objective F wells located east of the disposal cell, specifically in the Frog Pond area. Objective F well(s) should be added in this area.

Response H-57: The number of springs to be monitored and locations will be finalized in the RD/RA Work Plan. DOE's position is that since nitroaromatics are not found in the upper SED springs, and since Army operations are known to have had impact to a tributary which contributes to the SED south of these upper springs, then nitroaromatic contamination in the lower springs is entirely attributable to the Army operations and should be the subject of appropriate Army monitoring as part of Army CERCLA activities.

Response H-58: There is sufficient coverage across the site to fulfill Objective F using the existing monitoring well system. The final configuration of the monitoring program will be determined in the remedial design phase of the project.

MISSOURI DEPARTMENT OF CONSERVATION

Headquarters

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JOHN D. HOSKINS, Director

August 25, 2003

Larry V. Erickson
DOE Unit Chief, Federal Facilities Section
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, Missouri 65102-0176

Dear Mr. Erickson,

Thank you for compiling state response to the Proposed Plan and Supporting Evaluation for the Proposed Plan for Final Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site, Weldon Spring, Missouri. We have reviewed the documents and offer the following comments.

I-1 We are disappointed that the Proposed Plan and its Supporting Evaluation did not address many of the specific and constructive comments submitted in the April 31, 2003, letter from me to Pam Thompson of the Department of Energy. In spite of this setback, we continue to strive for an agreeable solution, in coordination with all state and federal agencies.

The Missouri Department of Conservation supports implementing Institutional Controls (ICs) to safeguard human health by limiting exposure to groundwater. However, it is difficult to anticipate the demand for groundwater use that could occur in the future, and the resulting impact that restrictions will have on Conservation Department property. It is essential to aggressively monitor contamination levels according to specifications recommended by the Missouri Department of Natural Resources. Frequent and thorough monitoring will measure the effectiveness of Monitored Natural Attenuation (MNA). If MNA is successful, restrictions on groundwater use could be reduced in the future.

I-2 The Conservation Department supports the development of informational brochures that will educate the public about the current groundwater contamination issue without discouraging their use and enjoyment of these lands. A brochure should be developed with input from all state and federal agencies involved that can be made available at the August A. Busch Memorial Conservation Area Office and the Weldon Spring Site Interpretive Center.

COMMISSION

STEPHEN C. BRADFORD, Cape Girardeau
ANITA B. GORMAN, Kansas City
CYNTHIA METCALFE, St. Louis
LOWELL MOHLER, Jefferson City

Response I-1: Comment noted

Response I-2: DOE is receptive to the suggestion of a cooperative effort for an informational brochure.

I-3 The Missouri Department of Conservation strongly supports agreeing to the details of these and other Institutional Controls before the Record of Decision is signed. Only by having ICs firmly in place will the health and safety of the public be assured. We are committed to working with the Department of Energy to finalize the ICs that will affect Conservation Department property.

We respectfully request that these comments, along with others specified in our April 31, 2003, letter, be addressed and incorporated into the final plan for groundwater contamination remediation. Attached for your record is the statement read on behalf of the Department of Conservation at the August 13, 2003, public meeting at Weldon Spring.

Thank you for the opportunity to comment and your serious consideration of our concerns.

Sincerely,

John Hoskins

JOHN D. HOSKINS
DIRECTOR

Attachment
c: Senator Christopher S. Bond
Senator Jim Talent
Representative Todd Akin
Representative Kenny Hulshof
Missouri Conservation Commission
Weldon Spring Citizens Commission
Steve Mahfood, Department of Natural Resources
Gale Carlson, Department of Health and Human Services
Cristy Gallagher, State of Missouri Washington Office

Response I-3: The DOE looks forward to continuing to work with the MDC to put institutional controls in place. DOE has continued its efforts with a written request to meet with MDC at its earliest convenience on this issue.

Missouri Department of Conservation Statement
Weldon Spring Public Meeting
August 13, 2003

I-4 "The public entrusts to the Missouri Department of Conservation the care and management of the land and its resources surrounding the Weldon Spring Site Remedial Action Project (WSSRAP). These public areas, known as the August A. Busch Memorial Conservation Area and the Weldon Spring Conservation Area, are enjoyed by half a million visitors per year. As population and development continue to grow in St. Charles and surrounding counties, it is expected that public use of these conservation areas will also grow. We take our responsibility to ensure the safety and enjoyment of these visitors very seriously.

Groundwater underlying these two areas is an essential component of their resource health. Contamination that lasts for 100, 500, or 1,000 or more years compromises our ability to use the natural resources in a way that ensures our visitors' safety and health. We are well aware of calculations that show little risk at anticipated exposure levels. However, we are also aware that such calculations may change as more is learned about specific contaminants, and that conditions over time may increase exposure levels. All these factors require that groundwater contaminants be monitored and treated to the extent technology makes possible.

I-5 We would consider Monitored Natural Attenuation an acceptable alternative under the following circumstances:

- If the state and federal agencies agree that groundwater remediation is not technically feasible at this time.
- If the state and federal agencies agree to revisit the issue as new technologies become available regardless of changes in exposure risks.
- If the state and federal agencies collect data that demonstrate to our agency and the public that the contamination is not spreading or impacting ecosystems on Department of Conservation property.

I-6 Additionally, we question the efficacy of several trigger points and contingency actions in the proposed plan and supporting evaluation, and request the following monitoring practices be adopted:

- When TCE levels exceed drinking water standards (5 micrograms per liter) in any unweathered zone well, the ICO hotspot treatment or alternative remedial action should be initiated regardless of the TCE concentrations in the plume. A trigger point of 20 ug/l, as indicated in

Response I-4: DOE acknowledges MDOC's leadership role in the care and use of the State owned lands surrounding the DOE site, especially those areas impacts or potentially impacted by the contaminated groundwater from the Chemical Plant area. We agree that groundwater contaminants should be monitored and treated to the extent technology makes possible and we believe that DOE has put forward a plan that accomplishes this stated goal.

Response I-5: Regarding the three bulletized conditions: 1) We believe that state and federal agencies do agree that active groundwater remediation is not technically feasible at this time. See also response to comment H-2 regarding state acceptance. If the selected remedy remains protective, there is no requirement to evaluate new technologies. See also response to Comment G-1. The third bullet emphasizes data collection, which is an integral component of the selected remedy.

Response I-6: DOE does not agree with the lower concentrations suggested by MDOC (reiterated by MDNR). These trigger levels will be finalized in the RD/RA Work Plan. Annual fish sampling will be considered during the development of the design of the performance monitoring and/or in the further development of the Long Term Surveillance and Maintenance Plan.

I-6 cont.

your document, is unacceptable, and remedial action should not be dependent on contaminant levels in the plume.

- Similarly, at Burgermeister Spring, active remedial alternatives should be implemented when TCE levels reach 5 ug/l, regardless of concentrations in the plume.
- Fish tissue sampling should be conducted annually to inform the public about the safety of fish consumption from Department of Conservation lakes and the effectiveness of Monitored Natural Attenuation.
- At Burgermeister Spring, the trigger point for uranium should be 100 pico-Curies per liter, not 300 pCi/l as your document indicates.
- Additional monitoring wells whose number and placement coincide with recommendations made by the Missouri Department of Natural Resources should be created to determine the current vertical and horizontal extent of contamination, and to confirm plume locations and attenuation.

We would like to emphasize the need to aggressively monitor groundwater contamination. By allowing contaminated groundwater to continue to spread to this high use public area, the Department of Energy is effectively removing the value of the groundwater resource from Conservation Department property."

Kay Drey 515 West Point Ave. University City, MO 63130

9 pages

September 3, 2003

Ms Pamela Thompson, Project Manager
Weldon Spring Site Remedial Action Project
US Department of Energy

Fax: 636-447-0739

Dear Ms. Thompson:

Re: Proposed plan for final remedial action for the groundwater operable unit at the Chemical Plant area of the Weldon Spring Site.

J-1 These comments are being submitted as an addendum to the comments and attachments I submitted at the August 13 public meeting at the Weldon Spring Interpretive Center. I am writing again to urge the Department of Energy to make every effort possible to extract the contaminated groundwater and potentially releasable masses of radioactive materials lodged in the crevices of the bedrock at the Weldon Spring Quarry area and at the former Uranium Processing/Chemical Plant sites — before decreeing those sites to be "cleaned up."

Or if it is not technologically possible or "too expensive" for the federal government to remediate the groundwater, I believe the DOE should declare the areas with the contaminated groundwater, aquifers and bedrock (areas that are both on- and off-site) to be off limits to the public — as far into the future as the hazard persists. For example, 4.5 billion years times ten, for uranium-238. Wouldn't it be remarkable if a human institution could remain in control for even the first several decades?

I realize you are seeking comments that address the groundwater at the Chemical Plant. However, with the departure of the DOE perhaps imminent, I wanted to take this chance — perhaps the public's last chance — to urge you to stay around longer, **and not to walk away from the contaminated groundwater throughout the Weldon Spring Site.**

J-2 While we can hardly expect the DOE and its Weldon Spring project management contractor (Washington Group Intl. and Jacobs Engineering Group) to install even more monitoring wells and additional interceptor trenches — which could further exacerbate the dispersal of the contaminants — I believe they should at least warn the public of the clear and present and future dangers of the Weldon Spring ground- and surface waters. The DOE should at least explain to today's and future fishermen, water consumers, air breathers, Katy Trail hikers and bikers and other tourists, and residents that the locations, migration patterns, and health hazards of the permanently radioactive Weldon Spring groundwater wastes are not now and may never be precisely known or accurately predictable.

J-3 After Weldon Spring's one-billion-dollar cleanup, the public may well be disappointed and even incredulous to learn that things are not really all cleaned up. But I think an honest appraisal would be welcome, and from a health standpoint, should be required. I appreciate the efforts of the hundreds/thousands (?) of workers, administrators, engineers and others who have contributed toward the cleanup of Weldon Spring. I hope, however, that you will not lock up and leave until the groundwater is remediated and/or the public is responsibly warned — in perpetuity.

Response J-1: DOE is not decreeing the groundwater to be "cleaned up." Monitored Natural Attenuation is a systematic monitoring approach with rigorous data collection and trending to determine if attenuation is progressing as predicted. Contaminated groundwater will be "off limits" to the public through the implementation of institutional controls that will prevent a residential or agricultural exposure to groundwater. The attenuation process is expected to take approximately 100 years, not billions of years. DOE has no intention to "walk away" from the contaminated groundwater or the rest of the site. We recognize our long term obligations and have committed to monitoring the site for the foreseeable future. Human institution (federal, state, and local governments) have controlled access and development in the impacted areas for over 50 years and this ongoing control has a high expectation of success.

Response J-2: DOE will continue to provide information to the public that will keep them aware of the history of the cleanup of the site. The current focus of that effort is the Interpretive Center.

Response J-3: See response to Comment J-2.

1. **Mysterious meanderings of the Quarry groundwater:**

J-4 For as long as I can remember, when those of us who get our drinking water downstream from the Weldon Spring Quarry would ask why the highly contaminated Quarry groundwater was not detected in the St. Charles County well field, we would be told, "It gets captured by the Femme Osage Slough," that lies just to the south of the Quarry. (Highway 94 → Quarry → [Extraction/Interceptor Trench] → Katy Trail → Slough → Drinking Water Well Field → and then, the Missouri River, about 8 or 9 river miles above major St. Louis City and County drinking water intakes.)

J-5 If the contaminated Quarry groundwater has been migrating into the Slough for decades, why hasn't the Slough regularly overflowed? Where has all the Quarry water gone if, as we are told, it has never moved down-gradient into the well field and on into the Missouri River? I remember seeing the slough when it was completely covered by the 1993 flood waters. What happened to the Slough's contaminated sediment and soils at that time?

J-6 The explanations about the Quarry's groundwater migration have changed over the years. Now we are told the following about the fate and transport of the uranium in the groundwater within the alluvial aquifer — north of the Slough and south of the Quarry:

> This area contains a naturally occurring oxidation/reduction front, which acts as a barrier to the migration of dissolved uranium by inducing its precipitation. .... A distinct contact was evident across the [geochemical] study area separating alluvial soils with characteristics indicative of oxidized conditions from those indicating reducing conditions. The oxidized/reduced zone contact is characterized as a change in the physical characteristics of the alluvial material with depth. The geochemical sampling program was designed to obtain soil and groundwater samples from discrete intervals from both the oxidized and reduced zones. ("Weldon Spring Site Environmental Report for Calendar Year 2002," DOE/GJ/79491-931; pp. 111-112)

And it goes on. I am sorry that I do not understand this verbiage. I just continue to wonder how decades of groundwater containing dissolved and solid uranium and thorium, and their daughters, could have flowed into the slough area and beyond without any of the contaminants' reaching the groundwater below and south of the slough — including, of course, St. Charles County's well field.

Furthermore, if the radioactive wastes that have escaped via the Quarry groundwater path have indeed been adsorbed, reduced or otherwise entrapped in the reduction zone north of the Slough, why is the DOE not directing its Project Management Contractor to **exhume the accumulation of sorbed, contaminated soils and sediments in the reduction zone at this time**, and somehow isolate them? Or at the very least, why is the public not diverted away from that area? Shouldn't the Katy Trail be relocated away from the reduction zone? Shouldn't fishing in the Femme Osage Slough be prohibited by means of "institutional controls"?

2. **Groundwater impacts on the Femme Osage Slough:**

J-7 I have never understood why the Missouri Department of Conservation has allowed people to fish in the slough — a major destination of the Quarry's solid and dissolved uranium, and of thorium (via colloidal transport, and perhaps in the form of thorium-nitrate or other dissolved thorium compounds. (Thorium-nitrate is very soluble in cold water.) The slough is also a major destination of the thorium

Response J-4: The comment is related to another Operable Unit (the Quarry Residuals Operable Unit in this case), which is not the subject of the Proposed Plan and this responsiveness summary. The DOE has prepared Administrative Records (ARs) for the other Operable units that have already been completed for the site. These ARs contain relevant information about these Operable Units.

Response J-5: see Response J-4.

Response J-6: see Response J-4.

Response J-7: see Response J-4.

J-7 cont. and uranium daughter products. The radioactively hot Belgian Congo pitchblende wastes from the Downtown Mallinckrodt plant were dumped into the Quarry from 1959 till 1969. They were saturated by rain and snow over the years, and by the fluctuating water table, and were readily available to migrate out of the cracks and fissures in the walls and floors of the porous limestone Quarry, into the groundwater, and on into the slough.

While fishermen were always assured that it was safe to fish in the slough, an environmental monitoring report published by the DOE in 1982 makes such assurances seem highly suspect. I am attaching pages 18, 38 and 39 from the report, entitled "Weldon Spring Storage Site Environmental Monitoring Report for 1979 and 1980," by RB Weidner and MW Boback, of NLO (National Lead of Ohio). Laboratory tests of the slough fish found elevated levels of radioactive lead-210, total uranium, radium-226, and thorium-232 (with its incredibly long half-life of 14.1 billion years).

Apparently fish bioassays were not performed to test for the predominant Quarry contaminant, thorium-230. I would think that at the very least, bottom feeders may have ingested thorium-230 from the slough sediments. And no doubt, still are. (Thorium-230 has a half-life of 75,400 years.) Tests were also apparently not performed to detect notoriously radiotoxic isotopes present in pitchblende — actinium-227, for example, (with a 21.77-year half-life) and protactinium-231 (with a 32,500-year half-life). Uranium-235, the progenitor, has a half-life of 704 million years.

While the NLO lab data in the 1982 report indicate higher levels of radioactivity in the "bone portion" of the fish (bullhead, carp, and bass) than in the "edible portion," I've been told that many local fishermen grind up the whole fish — bones and all — to make fish cakes.

Fish bioassays performed by contractors subsequent to NLO have not reported levels as high in fish as those reported by NLO. Since the data analyzed by different laboratories are not consistent with one another, I believe the data cannot be considered a reliable basis for making a decision about the safety of the fish. If any uncertainties exist about the migration into the human biosphere of these long-lived, known carcinogens, and if the DOE refuses to clean up the groundwater, or lacks the requisite technologies to do so, then I believe fishing should be prohibited in the potentially affected bodies of water — including the Femme Osage slough; Busch Wildlife lakes 34, 35, 36 and the Hampton Lake; and the Dardenne Creek and other big and little streams and rivers.

J-8 **3. The Quarry, and therefore its groundwater, are still contaminated.**

Although the removal of the Quarry bulk wastes was substantially completed in 1995, much contamination obviously still remains. A sample collected from a groundwater monitoring well, located in the alluvium between the Quarry and the slough, contained 4,420 picocuries of uranium per liter just last year, compared to the average background level of 0.93 pCi/L (according to the "Weldon Spring Site Environmental Report for Calendar Year 2002," pp. 94 and 56).

I do not understand why thorium-230, as the major contaminant in the Quarry, was not included in the interceptor trench field study at the Quarry. (DOE/GJ/79491-916. May 2003)

Even with access to state-of-the-art data collection and mapping technologies (e.g., math computer codes and the Geographic Information System), your ability today to predict the potential rate of natural attenuation of the Weldon Spring uranium seems to be drastically reduced by the many basic unknowns — as is your ability to predict the migration of the uranium in the groundwater. If today's

Response J-8: see Response J-4.

The limestone bedrock beneath the Chemical Plant has been characterized as having clay filled fractures. The current sources of uranium in the groundwater and springs are the absorbed uranium and contaminated sediment in the shallow aquifer system (including the conduits) and the adsorbed material in the vadose zone. Uranium entered the shallow aquifer from the raffinate pits via infiltration through the overburden. Geochemical investigations previously conducted by the USGS indicate that uranium readily sorbs to the overburden materials, thus limiting its transport to the underlying shallow groundwater system. The results of these investigations suggest that the uranium infiltrating from the raffinate pits had reduced mobility because of adsorption to materials in the saturated overburden and supports the limited extent of uranium contamination detected in the groundwater.

J-8 cont. scientists and engineers can only estimate and guess about the volumes, locations, migration rates, and directions of the uranium in the shallow aquifer and bedrock, what about predicting the future — extending for the duration of uranium's radioactive, hazardous life of 4.5 billion years, times ten? And what about the other Weldon Spring radioactive contaminants of concern — including, apparently, isotopes present in recycled (post-fission) uranium, such as technetium-99 (with its 213,000-year half-life). Technicians are supposed to work with Tc-99 only in a glove box; it is not supposed to be distributed where recreational visitors are apt to be exposed.

A revealing description of just one of today's many unknowns is included in the "Evaluation of the Performance of the Interceptor Trench Field Study" — in this case, regarding the bedrock near the Quarry:

> An issue was raised regarding the estimate for the distribution coefficient for uranium in the bedrock portion of the aquifer. The uranium concentrations determined for the bedrock samples were low and may be at or near background. Background for uranium has not been measured for the bedrock units present at the quarry. For this least mass simulation, the model did not account for any uranium sorbed to the bedrock in the area of uranium impact, even though it is evident that some uranium must be present in the bedrock aquifer materials based on uranium concentrations measured in the rim wells at the quarry. The uranium is likely present as residual contamination possibly sorbed to aquifer material in secondary porosity features (i.e., fractures and solution features) in the limestone between the quarry and the area north of the interceptor trench, rather than uranium sorbed to the limestone itself. (Revision 0, May 2003, p.S3)

Is it not probable that similar unknowns exist about the bedrock and groundwater at the Weldon Spring Chemical Plant area?

I would like to add one final observation about Metropolitan St. Louis' radioactive wastes, some of which we have had in our midst for 61 years (!!), and some of which will continue migrating above and below ground at the Weldon Spring Chemical Plant Site and Quarry, perhaps forever. I find it incomprehensible that the nuclear industry and its associates in the federal government are continuing to promote the production of new nuclear reactors and bomb designs, and the extended operation of existing reactors, when no known safe technology or location exists for the permanent disposal of the radioactive wastes such facilities have already generated. These wastes are distributed virtually nationwide and may never be able to be isolated from the human biosphere for the requisite millennia.

Perhaps you'll appreciate a favorite quote: "If you're not outraged, then you're not paying attention."

Sincerely,

Kay Drey

Encls: – Excerpts from NLO's Environmental Monitoring Report for 1979 and 1980.
– Questions about Weldon Spring's groundwater, etc., that I submitted to the DOE, 6/27/02.

NLCO-1176
SPECIAL
UC-11

excerpts

WELDON SPRING STORAGE SITE
ENVIRONMENTAL MONITORING REPORT
FOR 1979 AND 1980

by

Robert B. Weidner

and

Michael W. Boback

April 19, 1982

NLO, Inc.
P. O. Box 39158
Cincinnati, Ohio 45239

Natl. Lead of Ohio

PREPARED FOR THE
U. S. DEPARTMENT OF ENERGY
WEAPONS GROUP
UNDER CONTRACT NO. DE-AC05-76OR01165

Approved:

M. W. Boback
Director, Health & Safety Division

Approved:

Manager

Fish

For many years, the land along State Route 94 was a University of Missouri experimental area and access was restricted. On June 12, 1980, the land was opened to the public as the Weldon Spring Wildlife Area, administered by the Missouri Department of Conservation (MDC). Because the new land-use included fishing, arrangements were made with the MDC to collect fish specimens from the Femme Osage Slough for analysis.

On June 9, 1980, MDC personnel, using an electro-shocking technique, collected several species of Slough fish. The specimens were sent to a commercial laboratory where they were segregated according to species and disected. Samples of edible flesh and bone were taken for analysis. All samples were analyzed for total uranium, radium-226, lead-210, and thorium-232. Table 14 lists the results of these analyses. pg. 38,39

Radon-222

On June 9, 1980, passive radon monitors were placed at 14 locations at and near the pit area and quarry and at 3 offsite locations (see Figures 11, 12 and 13). These monitors consist of a special dielectric detector which is sensitive only to alpha radiation, such as that emitted by radon and its daughter products. The detector is mounted inside the bottom of a light plastic cup, about 3.75 inches high and 2.9 inches at the widest diameter (at the top). A special filter, supplied with the cup and installed over the mouth of the cup when the sampler is installed, prevents the entry of dust.

Table 14. Analysis of Slough Fish

Sample Description	Analysis	Results ±2 stnd. dev.
1. Four Bullhead	Gross Weight	339 gm
Four Big Mouth Buffalo	Gross Weight	916 gm
		1255 gm
Edible Portion	Wet Wt. for Analysis	534 gm
	Total Uranium	<2 ug/Kg wet wt.
	Ra-226	0.8 ± 0.2 pCi/Kg wet wt.
	Pb-210	6 ± 1 pCi/Kg wet wt.
	Th-232	47 ± 9 ug/Kg wet wt.
Bone Portion	Wet Wt. for Analysis	102 gm
	Total Uranium	84 ± 15 ug/Kg wet wt.
	Ra-226	8 ± 1 pCi/Kg wet wt.
	Pb-210	29 ± 5 pCi/Kg wet wt.
	Th-232	<100 ug/Kg wet wt.
2. Four Carp	Gross Weight	1869 gm
Edible Portion	Wet Wt. for Analysis	834 gm
	Total Uranium	<1 ug/Kg wet wt.
	Ra-226	7.6 ± 0.4 pCi/Kg wet wt.
	Pb-210	2 ± 1 pCi/Kg wet wt.
	Th-232	55 ± 15 ug/Kg wet wt.
Bone Portion	Wet Wt. for Analysis	158 gm
	Total Uranium	108 ± 15 ug/Kg wet wt.
	Ra-226	7.7 ± 0.7 pCi/Kg wet wt.
	Pb-210	26 ± 6 pCi/Kg wet wt.
	Th-232	150 ± 110 ug/Kg wet wt.
3. One Large Mouth Bass	Gross Weight	420 gm
Three Bluegill	Gross Weight	218 gm
Six Sunfish	Gross Weight	318 gm
Five White Crappie	Gross Weight	230 gm
		1186 gm
Edible Portion	Wet Wt. for Analysis	434 gm
	Total Uranium	3 ± 2 ug/Kg wet wt.
	Ra-226	8.8 ± 0.7 pCi/Kg wet wt.
	Pb-210	4 ± 2 pCi/Kg wet wt.
	Th-232	<20 ug/Kg wet wt.

1 μg = 1/3 pCi U-238

Table 14. Analysis of Slough Fish (Cont'd.)

Sample Description	Analysis	Results ±2 stnd. dev.
Bone Portion	Wet Wt. for Analysis	91 gm
	Total Uranium	<20 ug/Kg wet wt.
	Ra-226	17 ± 2 pCi/Kg wet wt.
	Pb-210	<20 pCi/Kg wet wt.
	Th-232	<90 ug/Kg wet wt.
4. Une Carp	Gross Weight	2392 gm
Edible Portion	Wet Wt. for Analysis	1178 gm
	Total Uranium	39 ± 4 ug/Kg wet wt.
	Ra-226	11.2 ± 0.6 pCi/Kg wet wt
	Pb-210	80 ± 8 pCi/Kg wet wt.
	Th-232	72 ± 19 ug/Kg wet wt.
Bone Portion	Wet Wt. for Analysis	166 gm
	Total Uranium	290 ± 20 ug/Kg wet wt.
	Ra-226	23 ± 2 pCi/Kg wet wt.
	Pb-210	26 ± 6 pCi/Kg wet wt.
	Th-232	<100 ug/Kg wet wt.

J-9 **Questions submitted to the US Department of Energy at the public meeting in the St. Charles County Government Bldg., June 27, 2002. [Not verbatim]. Kay Drey:**

A. Regarding the disposal cell:

1. Will the DOE have a continuing presence onsite at Weldon Spring to check to see that the remedy is still in place? Specifically, for example, in the case of the disposal cell: will the DOE be responsible for checking the top of the disposal cell to see if the "bathtub effect" has begun — that is, to see if subsidence has occurred — if the materials inside the cell have begun to collapse, causing the top to begin to sink, thereby causing rainwater to collect at the top of the cell?

2. What agency is to check to see how much radioactivity may be leaching into the groundwater? And how often?

3. What contingency plan is in place in the event the top of the cell begins to collapse, or if the level of contamination in the leachate indicates the cell is no longer providing isolation of the wastes from the environment?

B. Regarding the groundwater that flows below the Quarry and between the Quarry and the Femme Osage Slough — and about the sediments and soils that are in and around the slough — that is, in the area that drains into the St. Charles County public drinking-water well-field:

1. Will those soils and sediments be dug up? If so, who is to pay for that?

2. Who is to monitor the groundwater in that area for the next thousand years? And who is to pay for that?

3. Is there a contingency plan if the well-field becomes contaminated?

4. Will funds be given to the State Department of Natural Resources each year to oversee the monitoring activities at Weldon Spring?

C. Regarding the health of the St. Charles County citizens: (These questions were submitted in writing during the meeting, but were among an undisclosed number for which Pam Thompson announced, at 9:30 p.m., that no time remained.)

1. Is the Department of Energy planning to fund medical monitoring of people who live here in St. Charles County?

2. Is the DOE planning to do any epidemiologic studies?

3. I understand the Missouri Department of Health's study of infant mortality cost around a million dollars. Will the DOE reimburse the State for that study?

(I also mentioned my letter to Homeland Security Director Ridge, re concerns about the possibility that a terrorist could discharge explosives on top of the disposal cell, causing the dispersal of the wastes. I also said I have expressed concerns about the interpretive center ever since I first learned about it, and about inviting the public onto a site that will most probably still contain residual wastes.) #

Response J-9: These comments were submitted during the development of the LTS&MP and do not directly pertain to the GWOU. These and other comments were considered and grouped into discussion topics which formed the basis for three public workshops on improving the LTS&MP.

DOE does not plan to conduct or fund medical monitoring, epidemiological studies, or the infant mortality study. In the latter study (*Report on Perceived Excess of Infant and Fetal Deaths in O'Fallon, Missouri, in 2000*), the Department of Health and Senior Services noted on page 12, "DHSS believes no one is being exposed to radioactive contamination through groundwater in the area of the site."

9-03-03 1 page only

To: Pam Thompson
U.S. Dept. of Energy
ph: (636) 447-0739
fx (636) ~~447-0739~~ 447-0803

From: Virginia Dowden
Resident
ph: (636) 828-5800
fx: (636) 828-5100

K-1 The Dept. of Energy has done an amazing clean-up job at the Weldon Spring Site. An extremely high percentage of contaminants have been removed or placed in the Disposal cell which has built in safeguards.

It is highly possible that all remaining contaminants will never be removed. The site will continue to be monitored. As new technology is discovered, it should be carefully evaluated as results could be harmful in the long run. Ex: Sodium permanganate left chromium (a heavy metal).

Burgermeister Spring is a window to monitor residuals. As such it needs to be sampled frequently both in high water and low water flow especially the latter.

Results of monitoring should be shared at a public meeting (in laymen's terms) once time/yr.

It is also incumbant upon the public to use common sense when utilizing facilities on both the Weldon Spring Site, the trails, and in Busch Wildlife.

I want to thank (DOE) you again for an excellent job.

Response K-1: DOE appreciates the support indicated in this comment. The comment regarding the potentially harmful effects of utilizing innovative technology is well taken. The Burgermeister monitoring frequency suggestion will be further evaluated as the performance monitoring plan is developed. The once-a-year public meeting has been previously discussed and is presently planned for in the Long Term Surveillance and Maintenance Plan.

Karl Daubel
15022 Willow Lake Ct.
Chesterfield, Missouri 63017

Pamela Thompson, Site Manager
U.S. Department of Energy
Weldon Spring Site Remedial Action Project
7295 Highway 94 South
St. Charles, MO 63304

Dear Ms. Thompson

The following are my comments on the Proposed Plan for Final Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site, Weldon Spring, Missouri, August 2003 and Supporting Evaluation for the Proposed Plan for Final Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site, Weldon Spring, Missouri, August 2003.

The Weldon Spring Ordnance Works had 18 lines for the production of trinitrotoluene (TNT) and 2 lines for production of dinitrotoluene (DNT). The land conveyed to the Atomic Energy Commission (AEC) included the area of TNT Lines 1 and 2 and parts of the land for TNT Lines 3 and 4. This AEC property is now known as the Chemical Plant Area.

L-1 Page 2 of the Proposed Plan, second paragraph of Site History states that the Chemical Plant was used for "dinitrotoluene (DNT) production." There were no DNT production lines on the land used to build the AEC area, now known as the Chemical Plant. The two DNT production lines were located further west between Trinitrotoluene (TNT) production lines number 4 and 5, which are now part of the US Army Weldon Spring Training Area. Recommend that the words "and dinitrotoluene (DNT)" be removed from the sentence.

Page 5 of the Supporting Evaluation, first paragraph of Site Background likewise states that the Chemical Plant was used for "dinitrotoluene (DNT) production." As stated above there were no DNT production lines on the property now known as the Chemical Plant. Recommend that the words "and dinitrotoluene (DNT)" be removed from the sentence.

Sincerely,

Karl Daubel

Karl Daubel

Response L-1: The comment is correct, and this correction will be made in the ROD.

Additional Comments of 9-3-03 Re: DRAFT Proposed Plan for the Final Remediation Action for the Groundwater operable Unit at the Chemical Plant Area of the Weldon Spring Site, Weldon Spring, Missouri March 2003

Sent to DOE Fax # 636-447-0739
From Dr. Michael V. Garvey
208 Pitman Hill Road
St. Charles, MO. 63304

Please add these Comments to my Comments of 8-13-03 (enclosed) and respond to the following regarding the Groundwater Remediation at the Weldon Spring Site.

M-1 Comment 1. Please explain to me why the Department of Energy is not required to allow the Department of Natural Resources of Missouri to have a co-signatory role to the revised federal facilities agreement. It is my understanding that any other entity who might pollute in the state would be under the DNR's juristiction, please comment on this.

M-2 Comment 2. Please add the Department of Health's data on the public wells in the documentation and the DOE web site to realistically assess contaminate plumes. Please include screened intervals and map on a GIS database if possible.

M-3 Comment 3. Please do a survey of private domestic wells within a five (5) mile radius of the site that may not be represented in state archival records and include these in sampling to assess realistic contaminate plumes and obvious health ramifications.

M-4 Comment 4. Please include the public wells serving the Weldon Springs Height in this new well inventory and sampling.

M-5 Comment 5. Please explain how uranium and nitrate contamination exiting the ground water which exits to the surface at Burgermeister Spring is not affecting the water quality at Lake 34. In this regard, please describe the method to which this ground water is antinuated before it enters into the surface water of Lake 34. Does it mix with the surface waters or go back into the groundwater? Does the groundwater flow then later intercept Lake St. Louis or other deep wells in the groundwater flow direction?

M-6 Comment 6. Please describe why or if Lake 34, 35 and 36 could be used as a natural method of antinuation of contamination using a wetlands approach or other passive measures.

M-7 Comment 7. Please accept my suggestion for Lakes 34, 35, and 36 to be posted as "catch and release" only. Although it is not impacted by the chemical plant, please also add the Upper and Lower Femme Osage Sloughs as "catch and release" only.

M-8 Comment 8. Please give much more detail regarding institutional controls and referencethe Longterm Stewardship Plan in the document.

Response M-1: The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requires that each agency (in this case DOE and EPA) shall afford to relevant State and local officials the opportunity to participate in the planning and selection of the remedial action (Section 120(f)). An interagency agreement to implement remedial actions is discussed in Section 120(e)(2) of CERCLA and does not require that the State be given an opportunity to sign the agreement. Notwithstanding the lack of a requirement, the DOE and the EPA have provided the Missouri Department of Natural Resources (MDNR) several opportunities over the course and the last 15 years to sign the Federal Facility Agreement (FFA). Negotiations are currently underway to provide another opportunity for MDNR to become a signatory party to a tri-party agreement that will address the post-closure requirements at the site.

Response M-2: Due to confidentiality concerns, inquiries for data from their monitoring program should be directed to the Missouri Department of Heath and Senior Services (DHSS). The Missouri DHSS has concluded that the private wells that they have sampled have not been impacted by the DOE site, so inclusion of this data would not alter the depictions of the contaminant plumes.

DOE analytical data from the monitoring wells and springs, as well as monitoring well construction information can be accessed on the Grand Junction Web Site at www.gjo.doe.gov/programs/ltsm.

Response M-3: A survey of the area between the chemical plant and the discharge point (Burgermeister Spring and Dardenne Creek) was performed by the landowner (MDC). No private wells were identified. The remainder of the wells discussed is a compilation of all possible databases to identify groundwater usage in the area. None of the wells are along the flow path from the Chemical Plant; however, they were discussed to illustrate the limited usage of groundwater in the area and to show that groundwater has not been impacted in these areas. A survey of wells outside the MDC property is not warranted.

Response M-4: The deep well used by Weldon Spring Heights was included in the groundwater usage evaluation and the potable water supply at Weldon Spring Heights is part of the program performed by the Missouri Department of Health and Senior Services. The Department of Energy has no connection with this monitoring program. This well is not located along the groundwater flow path from the chemical plant site and groundwater is produced from the deep aquifer, which is not the impacted aquifer for this operable unit.

Response M-5: Spring water discharging from Burgermeister Spring has elevated levels of nitrate (2002 range of 0.94 to 11 mg/l) and uranium (2002 range of 8.6 to 100 pCi/l). This water flows to a tributary that enters at the top of Lake 34. The entire water shed for lake 34 consists of approximately 650 acres. The amount of impacted groundwater that contributes to the total volume of water in Busch Lake 34 is negligible.

(Response M-5 cont.)

Some attenuation processes occur along the flowpath from the spring to Lake 34, in particular, dilution with other surface waters. The drainage between Burgermeister Spring and Lake 34 is a gaining stream segment meaning that the discharge from the spring remains as surface water.

Data collected from wells located near Dardenne Creek indicate that the shallow aquifer, which includes the Burlington-Keokuk Limestone, and the middle aquifer discharge to Dardenne Creek in this area because of upward gradients and artesian conditions. The potentiometric surface of the deep bedrock aquifer is significantly lower that than of the shallow and middle aquifers, indicating a limited hydrogeologic connection between the deep and upper aquifers. No downstream or downgradient impacts are measurable past Dardenne Creek.

Response M-6: The uranium levels in both Burgermeister Spring and Lake 34, while greater than background, do not pose a risk to the recreational users of the area or the ecological system. Levels of uranium in both the spring and the lake have decreased over time because of the cleanup of uranium contaminated soil at the chemical plant. Monitoring of the groundwater and springwater over time will verify that levels continue to decrease due to attenuation of the remaining contamination in groundwater. In one sense, Lake 34 already provides passive natural attenuation due to the dilution effect of this large body of water. No additional attenuation measures are warranted.

Response M-7: See response to Comment A-5.

Response M-8: The Long Term Surveillance and Maintenance Plan is referenced in the Proposed Plan. DOE will consider providing additional details regarding the institutional controls, but the actual mechanisms and detailed real estate agreements will be developed after the ROD.

9-3-03 (cont)

M-9 Comment 9. Please describe the method by which the map was used to deliniate the institutional control area.

M-10 Comment 10. Please identify deep wells (both monitoring and public wells) which might be able to characterize vertical contaminate plume flow.

M-11 Comment 11. Please use all of the MO Department of Natural Resources and the Dept. of Conservations recommended trigger concentrations as they are more protective of the environment.

M-12 Comment 12. Why are the Uranium levels higher at the surface water at Burgermiester Spring than in the groundwater under the chemical plant?

M-13 Comment 13 How was the baseline uranium concentration for groundwater and surface water determined?

M-14 Comment 14. Please forward all surface water Uranium results taken. Please include a map showing locations of all sampling numbers at all the lakes & springs at both Busch and Weldon Springs WLA's and tributaries of the Dardenne Creek. Please include the Upper and Lower Femme Osage Sloughs.

M-15 Comment 15. Although not a part of the Chemical Plant Unit, I would also appreciate all sampling results of all the Public DrinkingWells and the Raw and Finished Water of the St. Charles County Wellfield above the detection limit for Uranium, Batuium and Arsenic. Please include all results even the ones which were later attributed to error and later retested to be Non Detect! Is DOE in agreement with Black & Vetch that the Arsenic levels at RMW 2 and RMW 4 show an increasing trend? Does the DOE still feel that the plumes of contamination from the Quarry do not cross the Femme Osage Sloughs into the well field proper in light of the results consistantly seen at RMW #2 and #4? Does the DOE feel that it might be reasonable for the PW District #2 to seek alternate water supplies instead of using the old St. Charles Wellfield?

Response M-9: See Response A-4.

Response M-10: The unweathered wells located at the Chemical Plant site are adequate to monitor possible impact below the weathered Burlington-Keokuk Limestone. Existing wells include MW-2021, MW-2022, MW-3006, MW-3026, and MW-4007, and MWD-112. One or two additional wells may be drilled as part of the remedy to supplement the existing well network. These well locations will be finalized in the RD/RA Work Plan.

Response M-11: DOE does not agree that the State recommended trigger concentrations are more protective. Exercising contingency activities unnecessarily, when they are not warranted based on risk, is simply more restrictive, not more protective. DOE will continue to discuss appropriate trigger concentrations with the State.

Response M-12: The current sources of uranium in the groundwater and springs are uranium contaminated sediments in the shallow aquifer system (including the conduits) and the adsorbed material in the vadose zone. Uranium entered the shallow aquifer from the raffinate pits via infiltration through the overburden. Geochemical investigations previously conducted by the USGS indicate that uranium readily sorbs to the overburden materials, thus limiting its transport to the underlying shallow groundwater system. The results of these investigations suggest that the uranium infiltrating from the raffinate pits had reduced mobility because of adsorption to materials (clays) in the saturated overburden and supports the limited extent of uranium contamination detected in the groundwater.

In contrast, the historical uranium concentrations in Burgermeister Spring indicate higher concentrations during high flow conditions. This suggests that during storm events, surface water runoff transported uranium contaminated soil from the Ash Pond and Frog Pond areas. The uranium was likely transported in both the dissolved and particulate forms. In the drainages downstream from Ash Pond and Frog Pond, surface water is lost to the subsurface, where a portion of the dissolved uranium was probably transferred to solid phases by adsorption, while the remainder of the uranium was transported through conduits and discharged to Burgermeister Spring. In addition to carrying the dissolved uranium, surface runoff also transported sediment contaminated with uranium into the subsurface, where it acts as a residual source of uranium contamination to groundwater.

Response M-13: The chemical plant area is located on a local surface water high and straddles a regional groundwater divide; therefore it was not feasible to conduct upgradient/downgradient water quality comparisons to determine the extent of site-related contamination in the groundwater system. During the remedial investigation, the DOE and Army performed a joint sampling event. It was necessary to use exiting on-site wells to estimate background levels of naturally occurring constituents. Several wells open to the Burlington-Keokuk Limestone were identified as potential background locations since these areas had not shown detectable

(Response M-13 cont.)

nitroaromatic compounds (a key contaminant at the training area) and were not impacted from historical source areas. The background monitoring wells were selected on the basis of (1) completion in similar hydrostratigraphic unit (e.g. weathered or unweathered), (2) location outside of areas directly affected by contamination from the chemical plant area, and (3) location upgradient or at a distance from explosive production areas. Because springs represent locations of groundwater discharge to the surface, the groundwater data collected from the background monitoring wells completed in the weathered zone of the Burlington-Keokuk Limestone were selected to represent background spring data.

Background surface water concentrations were determined from an upstream location on Dardenne Creek. The chemical analyses were performed on unfiltered samples; therefore, the results represent the total concentration in the dissolved and suspended phases.

A summary of background values and ranges for groundwater in the weathered and unweathered Burlington-Keokuk Limestone, springs, and surface water in the vicinity of the chemical plant is provided in the table below.

UNIT	Background Uranium (pCi/l)		
	UCL_{95}	MAXIMUM	MINIMUM
Weathered Burlington-Keokuk	0.93	0.94	0.41
Unweathered Burlington-Keokuk	0.48	0.56	0.28
Springs	0.93	0.94	0.41
Surface Water	1.7	8.2	< 0.68

Response M-14: Uranium data from the monitoring wells, surface water bodies, and springs can be accessed on the Grand Junction Web Site (www.gjo.doe.gov). Data is also presented in the DOE's Annual Site Environmental Reports.

Response M-15: DOE data from the production wells in the St. Charles County Well Field can be accessed on the Grand Junction Web Site (www.gjo.doe.gov). Data is also presented in the DOE's Annual Site Environmental Reports. Data collected independently at the well field and at the water treatment plant can be obtained by contacting St. Charles County government. Detailed comments regarding groundwater at the Quarry are not pertinent to the decision on groundwater at the Chemical Plant Area. The Quarry groundwater was the subject of the 1998 Record of Decision for the Quarry Residuals Operable Unit.

Written Comment for Public Meeting 8-13-03
Pam Thompson,Site Manager
DOE
Weldon Springs Remedial Action Project
7295 Hwy 94 South
St. Charles, MO. 63304

From: Dr. Michael V. Garvey
208 Pittman Hill Rd.
St. Charles, MO. 63304

M-16 RE; PUBLIC COMMENT FOR GROUNDWATER, SPRINGS PROPOSED REMEDIAL ACTION OF AUG. 2003

8-13-03

Dear Pam. Thompson,

I appreciate all the excellent work of the DOE and it's subcontractors and the MoDNR over the years to greatly improve the local conditions, as they may impact the public health of local residents. The St. Charles residents are grateful, but still concerned with the long term potential for some unexpected loss of intregrety of the disposal cell and the contaminated ground water and surface water left after the active remediation. Please keep me in the loop regarding the stewerdship of the site and the results of the sampling of the springs, disposal cell and of course the St. Charles County Well Field as long as it is in use for a drinking water supply. Hopefully the St. Charles County Well Field source for drinking water will not be needed in the immediate future as alternate supplies exist now to feed PWD #2.

Below are my formal comments to be used regarding thre proposed remediation of the groundwater and springs of the Site. My chief concern is found below in #1.

1. Because it has been fully documented that most of the contaminated shallow groundwater beneath the chemical plant area discharges to the surface in the vicinity of Burgermeister Spring and that according to the DOE no active remediation is reasonable closer to the chemical plant site; and that the surface water uranium concentrations in this spring is greater than the groundwater under the chemical plant: **the DOE should consider the feasibility of long term remediation of the surface water at that location.** Please address this request in writing in your final evaluation and recomendations. This contamination has for too many years been allowed to continue to degrade the St. Charles Counties surface waters and ground waters (ie Dardenne Creek and ponded waters ie. Lake 34 at Busch WLA).

2. As I mentioned too many years ago, long term storage should not have been placed at Weldon Springs, an area with groundwater contamination and a

Response M-16: See responses to A-1 through A-6.

M-16 cont.

complex hydrogeology, springs, highly fractured limestone with solution voids, enlarged fractures and karst features with **rapid** groundwater transport. Monitoring the long term intregrity of the disposal cell will be more difficult due to the groundwater contamination under the cell in this heterogeneous, highly fractured groundwater medium, with poorly connectioned voids which may hold contamination. (What is the design and screened intervals of the new Cell Detection Monitoring Wells?)

3. The Institutional Controls Location map on page 14 Figure 4 seems artifically drawn to include only chemical plant and the two springs SP-6303 PR-6301, it is too small an area! (How was it determined that the wells at Twin Island Lakes were not degraded by the the DOE Site? What are the results of the sampling of the other Perennial Springs seen in Figure 3 page 6. Perhaps if the groundwater flow from the plant site is to the north, some of these spring surface water results to the southwest could be used to determine the spring water quality local background levels? Where can one find the Missouri Dept. of Health private drinking water well results?)
Public comment 8-13-03 Dr. Michael V. Garvey cont.

4. Will signage at the springs (6301 & 6303) and the southeast drainages be placed and maintained to warn the public not to drink the water? Should bottom feeding fish be digested from Lake 34 at Busch WLA without some information regarding the potential bioconcentrations? I recommend that at the least a catch and release policy should be in place at Lake 34,35,&36 at Busch WLA and the Upper and Lower Femme Osage Sloughs at the Weldon Springs WLA.

5. What if it takes over 100 years to achieve drinking water standards and if the MCL for Uranium is lowered in the meantime? How was it determined to be 100 years?

Sincerely,
Dr. Michael V. Garvey
208 Pitman Hill Rd.
St. Charles, MO. 63304
mgarvey@garveyteam.com